MITSUBIHI FA-3415

MODEL

SERVICE MANUAL

1. SPECIFICATION

1.1 FEATURES

1) FULL COMPATIBLE TO THE IBM P.C. :

The size and position of the picture to operate the IBM system (8514A personal system/2 of 3 line mode and EGA /CGA each boards) is automatically adjusted at the click center of knobs on the front panel of the unit.

In addition, manual adjustment to the other computer such as APPLE II GS and MAC II can be available with the knobs.

2) VIDEO SIGNAL CAN BE INPUT ON A D-SUB AND BNC CONNECTOR :

RGB TTL separate (8 colors), RGBI TTL separate (16 colors pastel/saturation), RGB R'G'B' TTL separate (64 colors) and RGB analog signals can be input to D-SUB connector for FA34 and HA39 series. Also, RGB analog singal can input to BNC connector for FA3425 and HA3905 series. In addition, TTL text mode can be used by switched to text position.

3) AUTO-TRACKING FUNCTION :

Automatically tracking and synchronization over a wide range of horizontal (15.7-35.5KHz) and vertical (50-87Hz) scanning frequencies can be displayed correctly in the screen of monitor by the auto-tracking function, without any adjustment.

4) NORMAL AND WIDE SCAN :

The normal scan and wide scan selection for convenient picture size and position adjustment can be select the "SCAN MODE" switch. The selection function is available in a horizontal scanning range of 15-25KHz.

1.2 ELECTRICAL SPECIFICATIONS FOR FA34 SERIES

1) CRT DESCRIPTION

(1)	Size	:	14 inch diagonal (13"V)
(2)	Deflection angle	:	90 degree diagonal
(3)	Electron gun	:	In-line type
(4)	Focusing method	:	Electrostatic
(5)	Convergence method	:	Magnetic
(6)	Mask type	:	Black matrix
(7)	Trio spacing	:	0.28mm
(8)	Array	:	Dot trios
(9)	Phosphor type	:	B22/BL9
(10)	Phosphor persistence	:	Medium-short/Long
(11)	Face plate	:	Tinted glass (STD)
(12)	Surface treatment	:	Non-glare (STD)
(13)	Implosion protection	:	Banded with mounting lugs

2) POWER SUPPLY

(1)	Voltage	:	AC120V (90~132V) /AC220-240V ± 10%
(2)	Frequency	:	50/60Hz (± 1Hz)
(3)	Power consumption	:	90Watts (Max.)
(4)	Inrush current	:	less than 50A (0-peak)
(5)	AC leakage current	:	less than 750 μA (measured by IEC-380)

3) SIGNAL INPUT

(1) Analog video input (R.G.B channels)

- Input voltage : 0.7Vp – p (0.5~2.0Vp – p available)
- Input impedance : 75ohm to GND
- Signal polarity : Positive white

(2) TTL video input (R.G.B.I or R. R'.G.G'.B.B')

- Input voltage : 0.0 to 0.4V Low level
  : 2.7 to 5.0V High level
- Input impedance : 330ohm to GND
- Signal polarity : Positive white

(3) Separate/Composite sync.

- Input voltage : 0.0 to 0.4V Low level
  (TTL) : 2.7 to 5.0V High level
- Input impedance : 1kohm to GND
- Signal polarity : Positive/Negative

(4) Composite sync. on Green of Analog video singal

- Input voltage : 0.3Vp – p (sync.) 0.7Vp – p (Video)
- Input impedance : 75ohm to GND
- Signal polarity : Negative

(5) Others

The MODE signal (TTL) of PGA is allowed to input when the PGA mode is detected in "PRESET" mode.

4) DEFLECTION

(1) Horizontal

Automatic synchronization : 15.7KHz – 35.5KHz

(2) Vertical

Automatic synchronization : 50Hz – 87Hz

5) HIGH VOLTAGE

High voltage at CRT anode : 23.0KV ± 1.0KV
(At Beam current 400 μ A)

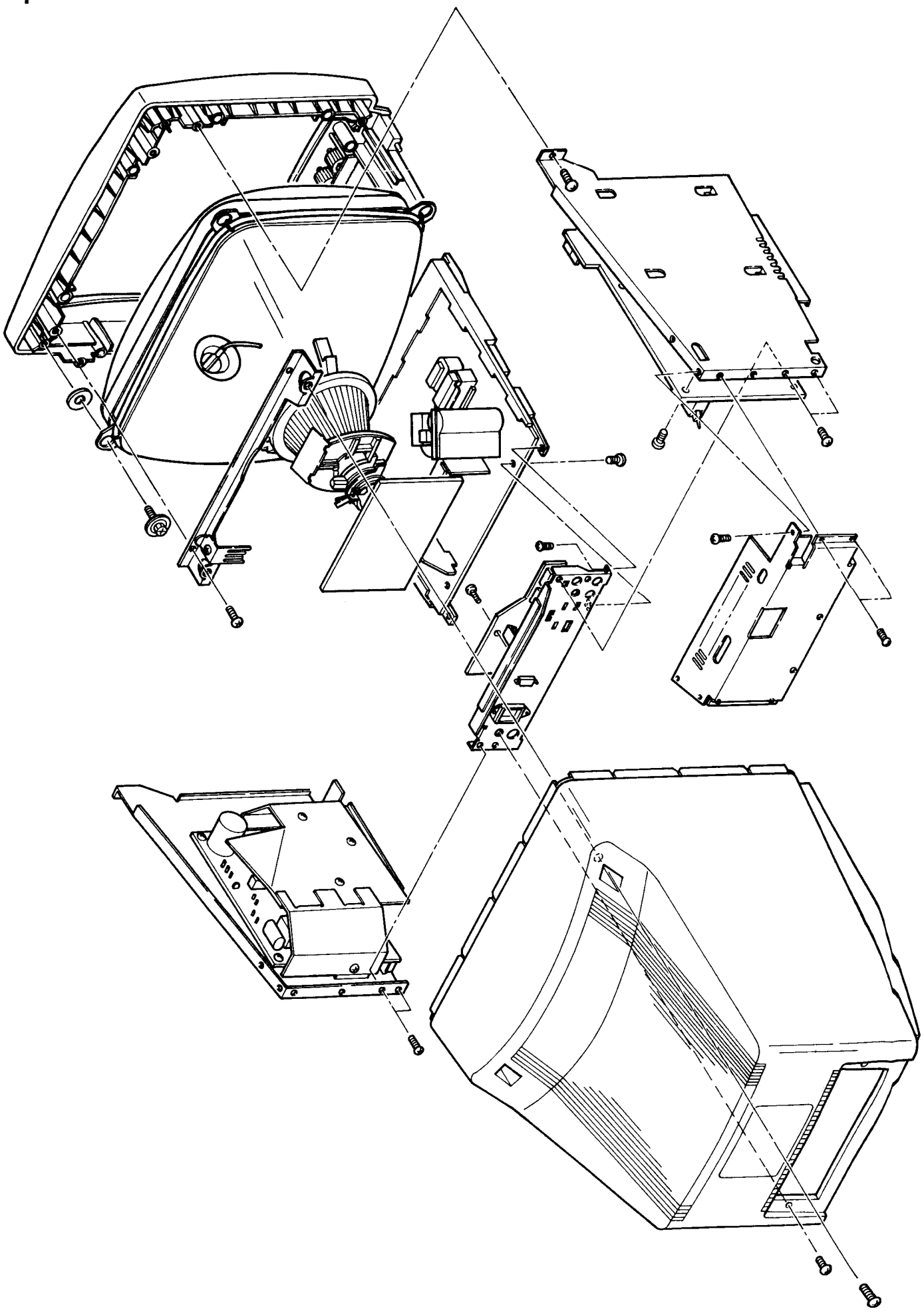
6) DEGAUSSING

Automatic degaussing : Activated at power on.

Ersatzteilliste für MS 14
Parts list for MS 14

Best.-Nr. Part.-No.	Bezeichnung	Description	Zeich.-Pos. Ref.-No.	Preisgruppe
46 037 00	Faltkarton	Gift box		C 1
46 038 00	Styropor, Satz	Polifoam, set		D 0
46 039 00	Frontrahmen	Fezel		E 1
46 040 00	Rückwand	Back cover		F 3
46 041 00	Platte, Rückwand	Rear plate		C 7
46 042 00	Bildröhre	Picture tube		J 9
50 097 00	Netzkabel	AC Power cord		C 0
46 043 00	Videokabel	Cable		E 0
46 044 00	DEFL-Platine kompl.	DEFL P.C.B. assembly		I 1
46 045 00	Video-Platine kompl.	Video P.C.B. assembly		H 3
46 046 00	Netzteilplatine kompl.	Power P.C.B. assembly		H 4
46 047 00	Bildröhrenplatine	CRT P.C.B. assembly		F 4
46 048 00	D-VR-Platine kompl.	D-VR P.C.B. assembly		D 2
46 049 00	TR-Platine kompl.	TR P.C.B. assembly		D 2
46 050 00	P-SW-Platine kompl.	P-SW P.C.B. assembly		D 2
46 051 00	V-VR-Platine kompl.	V-VR P.C.B. assembly		D 2
46 052 00	LED-Platine kompl.	LED P.C.B. assembly		C 8
46 053 00	Signal-Platine kompl.	Signal P.C.B. assembly		E 0

Exploded view



2. CIRCUIT DESCRIPTION

2.1 POWER SUPPLY

1) GENERAL

(1) 100 – 120VAC (220 – 240VAC) ± 10 % 50/60Hz

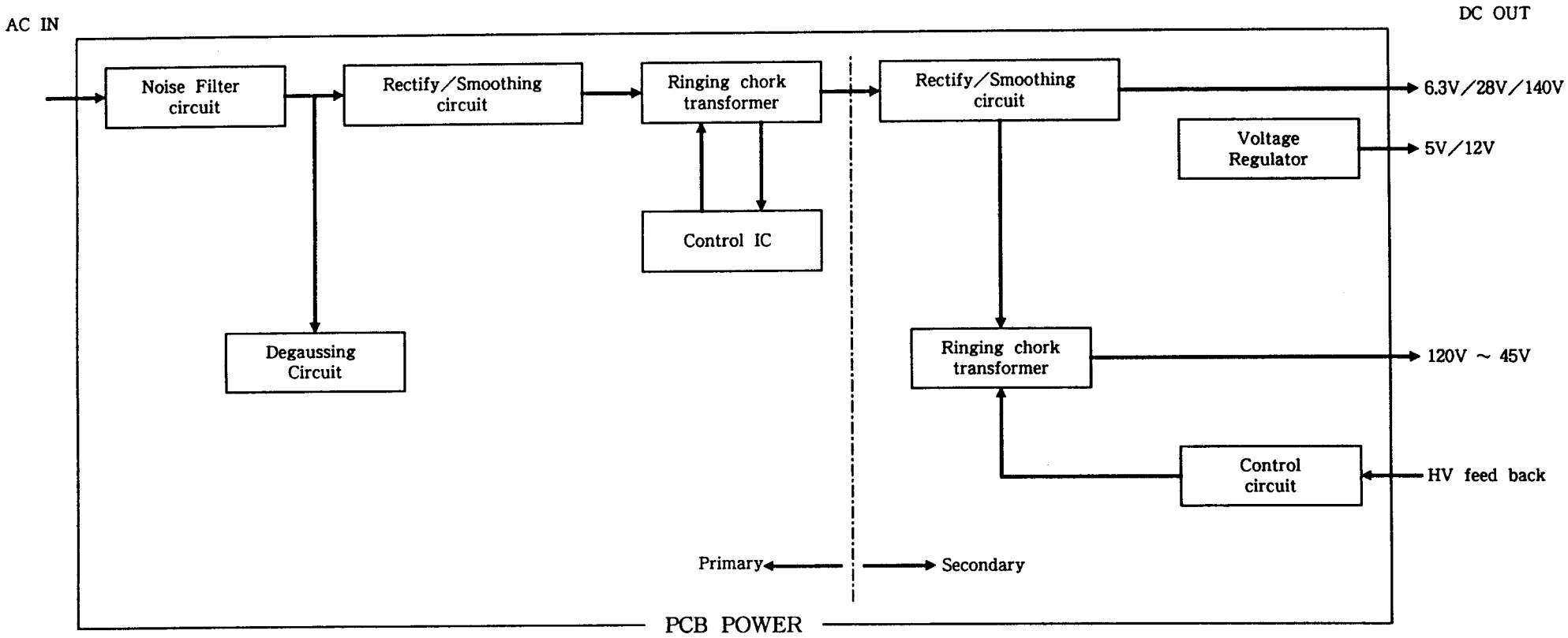
(2) The primary circuit of power supply is operated by RCC (Ringing Chork Converter) method.

(3) The secondary circuits produce to the following voltage which applied to each load.

(4) The power supply line 120~45V for anode voltage and horizontal deflection are produced by PWM (Pulse Width Modulation) method which switched from 140V line.

VOLTAGE LINE	ACTUAL OUTPUT VOLTAGE	MAIN LOAD
140V	140V	Horizontal output transistor drive
	120V ~ 45V	Anode/Horizontal Deflection power supply
28V	28V	Vertical deflection and horizontal tracking
15V	12V	Video amp, Vertical tracking
	5V	Control circuit with MPU/Gate array
6.3V	6.3V	CRT heater

BLOCK DIAGRAM OF POWER SUPPLY CIRCUIT



2) NOISE FILTER/RECTIFY/SMOOTHING CIRCUIT

(1) The noise filter circuit is operate to reduce the noise from both side of the internal or external of monitor.

(2) The AC input voltage is rectified by the diodes D901 – D904.
The rectified voltage is smoothed by capacitor C906.

(3) The thermistor TH901 and TH902 suppress the inrush current when turning ON.

3) DEGAUSSING CIRCUIT

This monitor has the degaussing circuit which composed by degaussing coil and posistor RP901.
When the turning ON, posistor of RP901 has small resistance which increase after go through the degaussing current so that it prevent the magnetizing from environmental magnetic field.
The re – degauss operation needs a cooling time of RP901 which about 5min.

4) RCC & CONTROL CIRCUIT

(1) When the AC input voltage applied to power supply circuit, starting current go through R905 and R909 which produce to the ②pin of IC991.
So the collector current of IC991 between ③pin and ④pin inflow from the primary side of ⑧, ⑥pin on the transformer of T931.

(2) Above collector current induce to the energy on ①pin of T931 which produce the current go through the C908, R904, D906 and R903 to ②pin of IC991.
As the result, IC991 is operated to ON so that collector current of ③pin increase.

(3) When the above collector current reached to $Ic = I_B \times hfe$, V_{CE} of power transistor in IC991 increase quickly. The applied voltage between ⑧ and ⑥pin of T931 increase to same value as V_{CE} of ③ and ④ on IC991, then ②pin of IC991 is reverse biased.
As result, IC991 operate to completely off.

(4) After above operation, IC991 is re – started by leakage current of T931 so that switching operation is keeping on.

(5) If over current inflow to R908 from the primary winding of T931, Q901 turn to ON then switching operation is stopping.

5) CHOPPER & CONTROL CIRCUIT FOR SECONDARY

5) – 1 CHOPPER CIRCUIT

(1) When the secondary line of 140V is applied from ⑭pin of T931, the starting current produce to base of Q951 through R954, then collector current begin to increase.

(2) Above current induce the voltage on ⑤pin of T951.
The induced voltage produce to the base drive current of Q951 through C970, R956, C969 and R955.

(3) When the collector current of Q951 reached to $I_B \times hfe$, V_{CB} of Q951 increase quickly and reverse biased so that Q951 is completely turning OFF.

(4) When Q951 is turning ON, the load current is supplied from ① and ④pin of T951 through Q951 and then this current induce the energy to ⑥ and ⑧ of T951, but it blocked by D955.
When the Q951 is turning OFF, above charged energy is discharged from ⑥pin of T951 which produce to the load current.
At this time, C969 is charged through D958 by discharged energy from ⑥pin of T951 which produce to the base current of Q951 during the turning ON time of Q951.

(5) The voltage of ② and ③pin on T931 is use for reference voltage which value is – 41V.
This voltage is controled by IC991, so the power supply line of secondary circuit is adapt

to the load condition.

(6) The power supply circuit have the over current protection circuit.
If over current inflow to the ③, ④pin of IC991, the voltage of R908 increase to more than 0.7V which increase the collector current of Q901.
The result of this operation reduce to base current of ②pin on IC991 so that transistor between ③ and ④pin in IC991 is turn to off.

(7) After discharged magnetical energy, this switching operation is keeping on by leakage current of T951.

(8) Output voltage of Q951 is controled by PWM method which controled to base current of Q951 by Q952.

5) -2 CONTROL CIRCUIT

The reference voltage of control circuit is made by zenner voltage of D956 which compared with feed backed voltage from flyback transformer by error amplifier of Q954, Q953,, Q952.
This voltage control to base current of Q951 which is stabilized to anode voltage by PWM method.

2.2 DEFLECTION

1) H – HOLD

The horizontal sync. pulse with positive polarity is applied to mono stable multi vibrator of IC502 which get the constantly pulse width according as each frequency.

After above operation, this pulse is converted to DC voltage by Q580 and C584.

Converted DC voltage is converted to DC current by Q581 and Q582 which charge to the apacitor C510.

When the voltage of C510 reached to enough value, it connect to the discharge circuit by IC501.

The concerning with collector current Ic of Q582, capacitor C of C510, voltage V of C510 and charge Q of C510 can be calculated by following formula

$$Q = \int idt$$

$$Q = Ict$$

$$V = Q/C = Ic \cdot t/c$$

In this mormula, more higher frequency make the more increased Ic, so that charge and discharge time t decrease which increase the free running frequency.

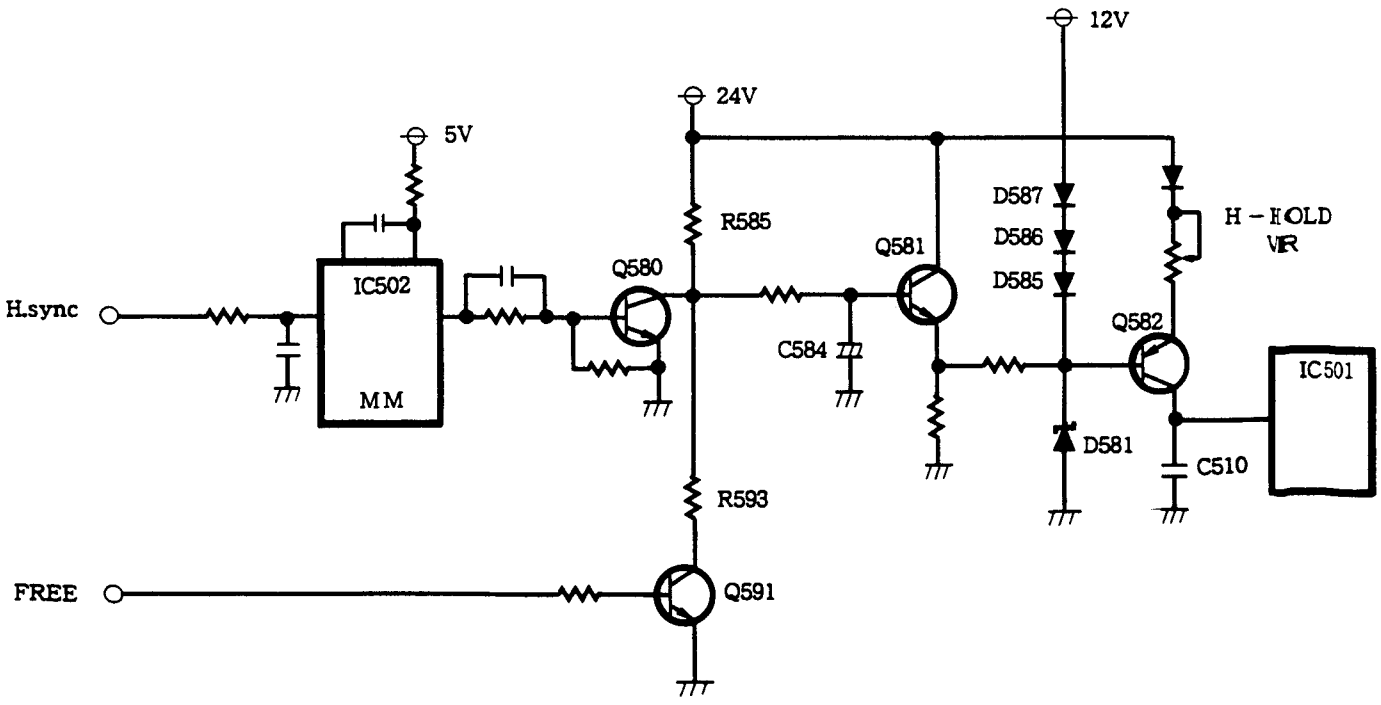
Normaly, base of Q591 is keep on low level, then base voltage of Q581 is applied from Q580.

In case of no signal, the base of Q591 keep on high level via video circuit, then base voltage of Q581 is fixed by R585 and R593.

As the result, above fixed voltage keep the free running frequency as about 25KHz.

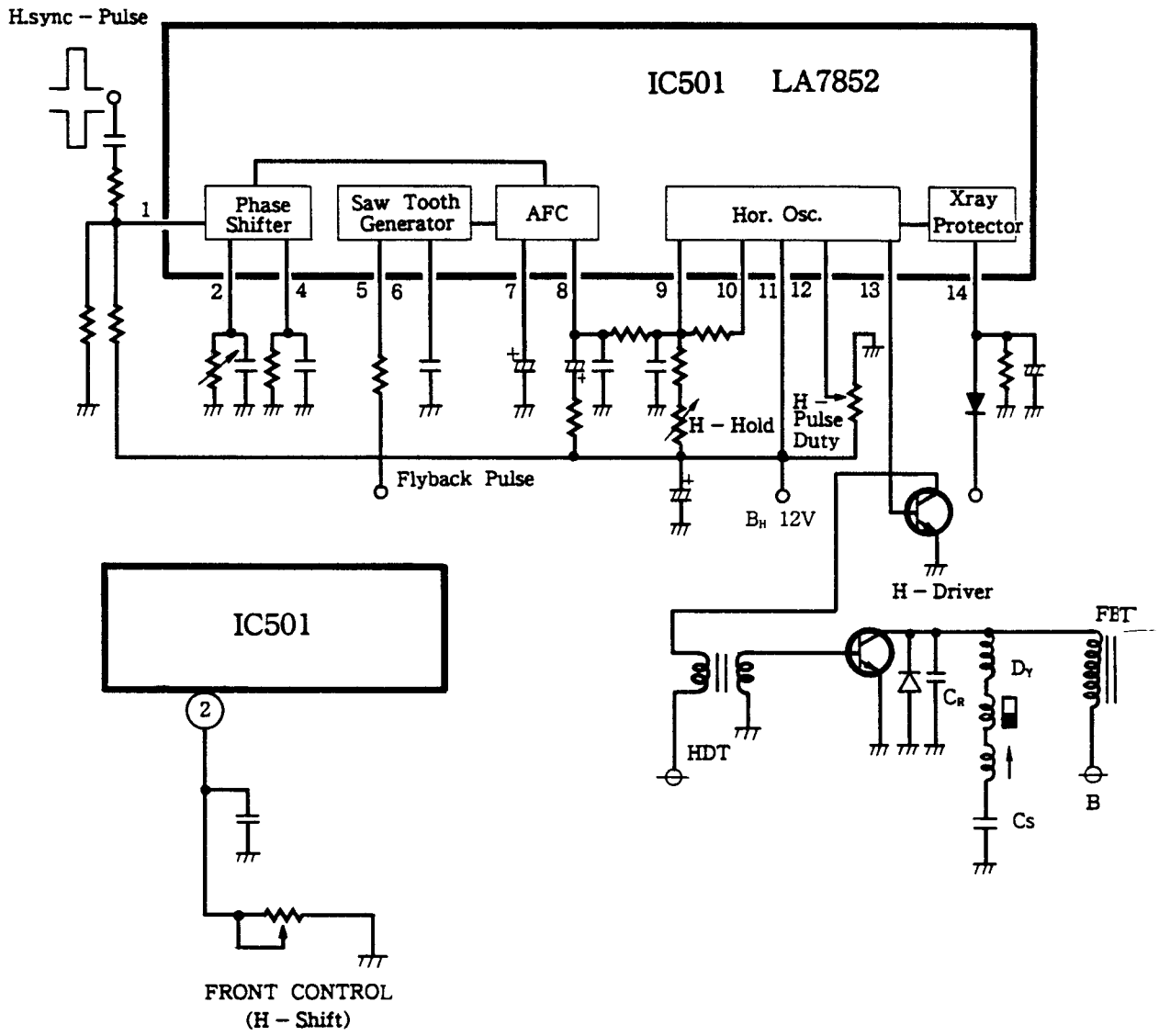
In case of the input signal is more than 35.5KHz, free running frequency is determined by D587, 586 and 585.

In case of the input singal is less than 15.7KHz, free running frequency is determined by D581.



2) HORIZONTAL DEFLECTION CONTROL

The horizontal deflection circuit is controled by IC501 which has phase shifter inside of IC. The phase shift control is controled by mono – multi and H – SHIFT control which made the more delayed pulse than sync. signal so that it can be control the raster position. The inner block of IC501 is shown as below.



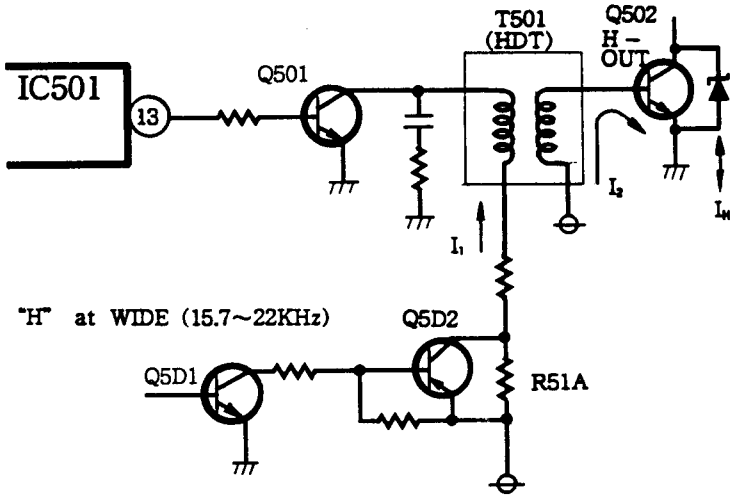
3) H – OUT DRIVE

In generaly, H – out drive is controled to constantly condition but this monitor have two scan mode (Wide or Normal) which is selectable by scan switch on rear panel.

The each condition is made by changing of the horizontal deflection current.

The mode switch is available in a horizontal scanning range of 15 to 25KHz.

If it select to "Wide" position, R51A is shorted by Q5D2 so that primary current (I_1) of T501 increase which increase to the secondary current (I_2).



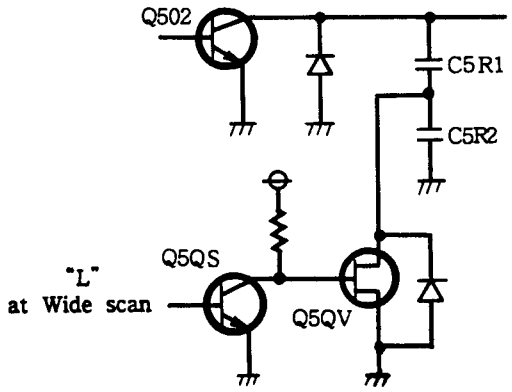
As the result, above operation supply to the enough deflection current for wide scan.

4) WIDE SCAN (C_R SELECTION)

When select to the "Wide – scan" mode, CR (Resonance Capacitor) in deflection circuit increase to C5R1 + C5R2 which increase to the retrace time, then it reduce to operate the high voltage of anode.

However, feedback circuit from high voltage supply line is control to the B4 voltage which get the stabilized high voltage.

The result of these operation, they increase the deflection current so that raster size can be expand.



Retrace $T_R = 2\pi\sqrt{Ly \cdot CR}$

H. Voltage $E_A \alpha B4 \cdot (T/T_R - 1)$

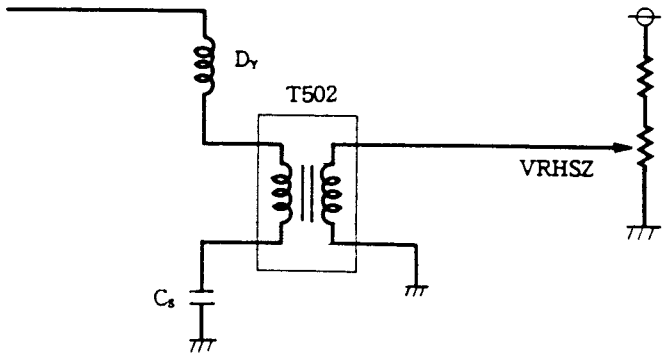
DY. Current $Iy = B4 \cdot T_S/Ly$

5) LINEARITY COMPENSATION (Cs)

The Cs of linearity compensation capacitor is changed to 4 elements which compensate to the raster condition for wide frequency range.

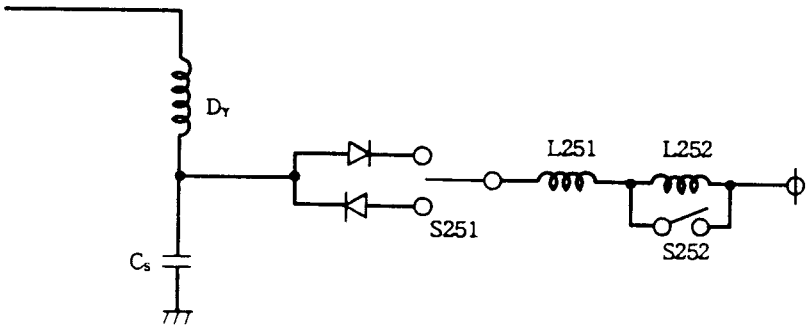
6) HORIZONTAL WIDTH CONTROL

The horizontal raster size is controled by VRHSZ (H – Size) on the front panel which change to the primary impeadance of T502 so that it control to the deflection current.



7) HORIZONTAL POSITION CONTROL

The horizontal raster position can be control by DC bias current of deflection yoke.



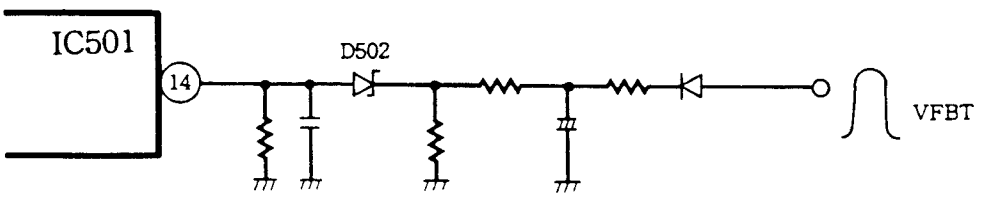
The switch of S251 is use for change to the polarity of DC bias current.

The switch of S252 is use for change to the value of DC bias current.

8) HOLD DOWN

The diode of D502 in horizontal deflection circuit is connect to between ⑭pin of IC501 and 3rd winding of ⑩pin on T504.

When the flyback pulse from ⑩pin of T504 increased (equivalent value as more than 28KV of anode voltage), D502 is turn to ON so that thyristor in IC501 is stopped to horizontal oscillation which protect the X – ray radiation.



9) V – HOLD

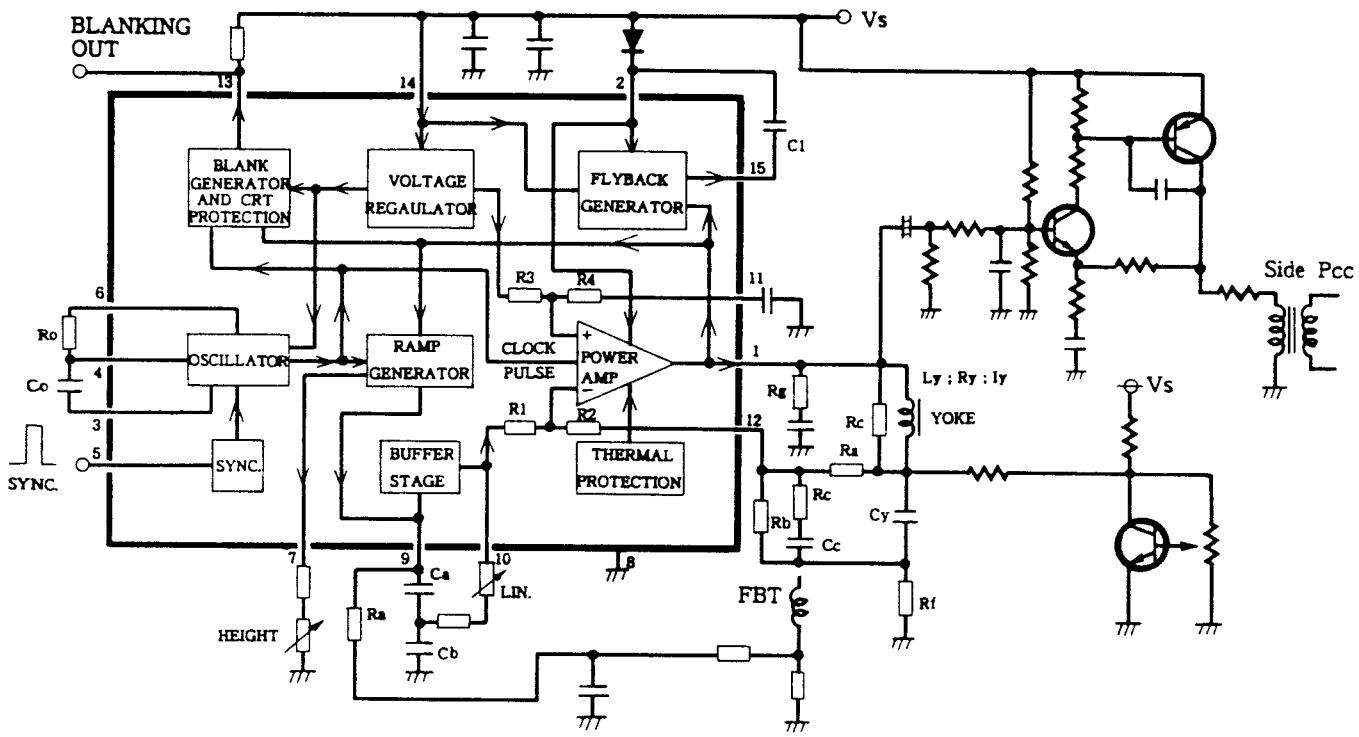
The operation of V – HOLD circuit is basicaly same operation as H – HOLD circuit.

The free running frequency of vertical deflection is controled by charge or discharge period of C404.

10) V – DEFLECTION

The vertical deflection circuit is directly drived by IC401.

The block diagram of vertical deflection circuit is as follows :



2.3 HIGH VOLTAGE

The pulse voltage of Vcp on horizontal deflection circuit is step uped by T504 of flyback transformer which supply to the high voltage curcuit of anode, focus and screen.
And 3rd winding of T504 produce to 80V, 180V power supply voltage.

1) THE RASTER REGULATION CONTROL

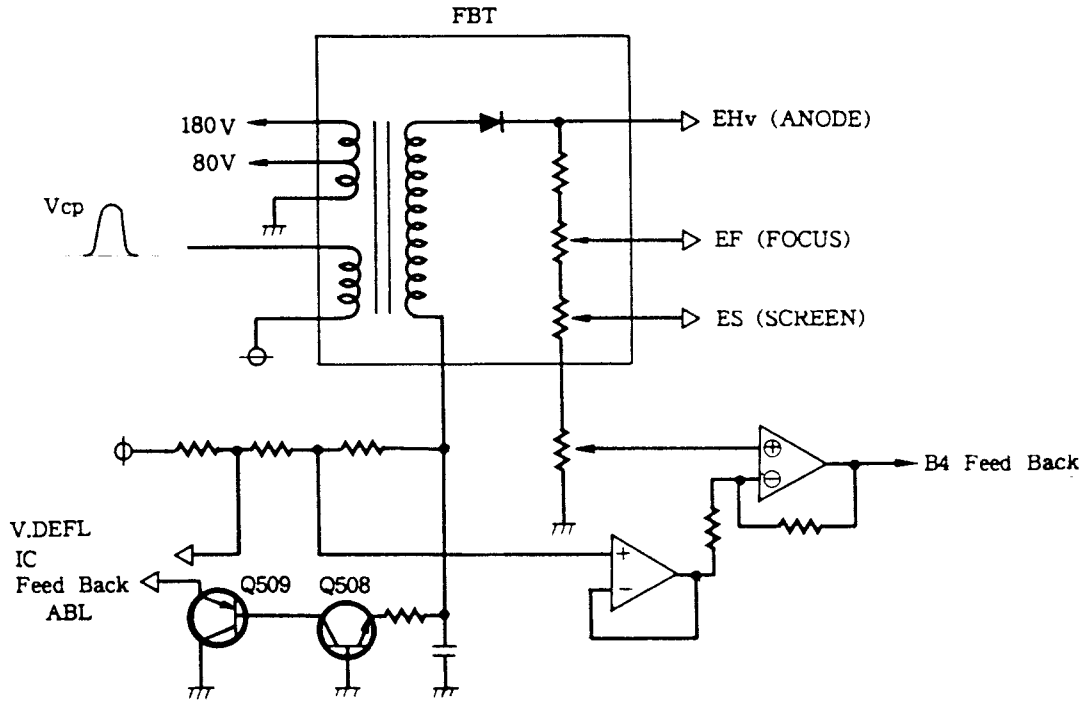
The flyback pulse for high voltage is supplied from horizontal deflection circuit and then the power supply line of video circuit is supplied from 3rd winding of T504.
When the beam current increase, the anode voltage is go down so that raster size change to more bigger than normal condition.
Therefore, the beam current is fed back to the B4 voltage control circuit which correct to the horizontal raster condition.
Also the beam current is fed back to the vertical height control circuit in vertical controler of IC401 which correct to the vertical raster condition.
So, these feed back circuit improve to the raster regulation.

2) THE HIGH VOLTAGE STABILIZED CIRCUIT

The devided anode voltage by breeder resistor in T504 is fed back to the B4 voltage line which is stabilized to the anode voltage.

3) ABL CIRCUIT

The detection circuit of beam current is composed by Q508 and Q509.
Q509 is use for current detector and Q509 is use for driver of ABL cuicuit which control to the gain of video signal then it automatically limit the beam current.



2.4 VIDEO

1) GENERAL

(1) The monitor can be input the following signals.

(1) – 1 Separated analog video + Separated TTL sync.

(1) – 2 Separated analog video + Composite TTL sync.

(1) – 3 Sync. on green

(1) – 4 Separated TTL video + Separated TTL sync.

(1) – 5 Separated TTL video + Composite TTL sync.

The TTL sync. signal is available to both polarity (Negative or Positive).

(2) Selection of Input singal

The selection of Analog or TTL signal is selectable by S203 which change to the operation of USER – CONT – VR (CONT, BRT).

(3) TTL INPUT

The TTL input signal is converted to digital to analog signal by IC201 which output is selectable to pastel 16 or saturated 16 or 64 colors by color mode select switch.
This monitor has Text display which display White Green or Amber monochrome color. (Only at TTL input)

(4) ANALOG INPUT

The analog input signal or digital to analog converted TTL signal input to IC202 which control to the DC clamping level, bias and gain.
The DC clamping level is determined by clamp pulse of ⑮pin and clamp level voltage of 16 pin on IC202.
The Gain is determined by DC voltage of ⑭ on IC202.
IC212 is operate to the detail gain adjustment which is controled to constantly brightness by IC209 connect at compatible P/C.

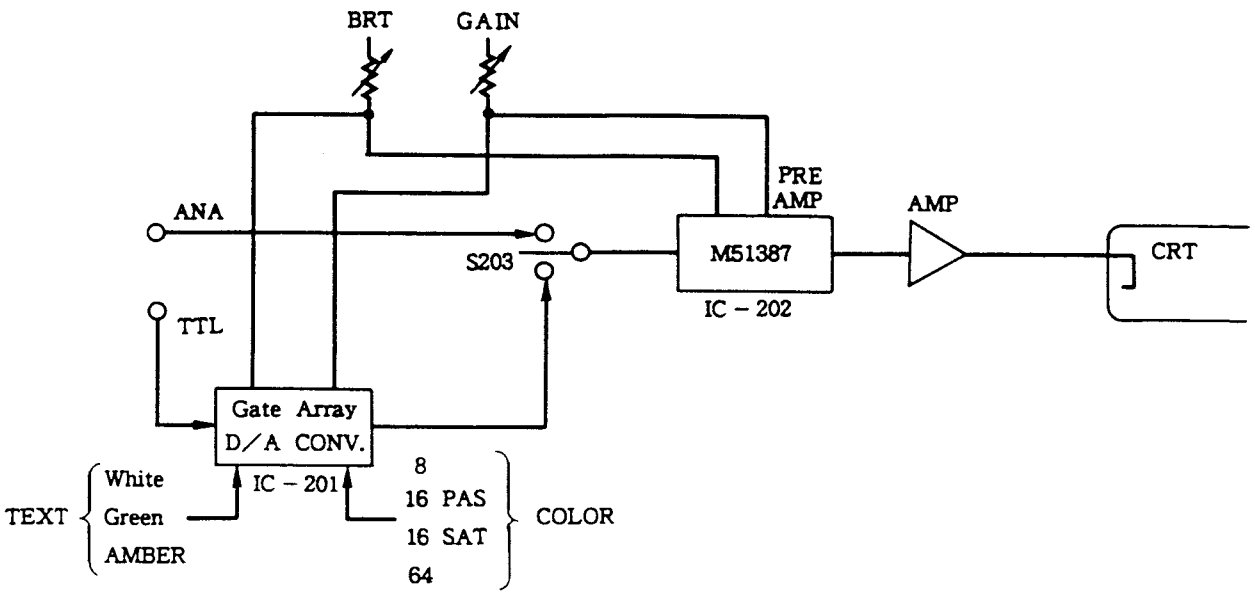
(5) BRIGHT, GAIN, USER – VR

The Brightness control with click center can be control to bias level at analog input and low intensity brightness at TTL input.

2) VIDEO CIRCUIT

The video input signal can be input from shrinked D – SUB ⑮pin connector which available to both of Analog or TTL signal level. (BNC is used only analog signal)
The Analog or TTL signal is selectable by S203 which input to pre – amplifier of IC202.

(1) Block Diagram of Video Circuit



(2) Pre Amplifier

(2) – 1 The TTL input signal is applied to the gate array of IC201. it is selectable to following mode by mode select switch on the rear panel.

- TTL
  - COLOR
    - 8 Colors
    - 16 Pastel Colors
    - 16 Saturated Colors
    - 64 Colors
  - TEXT
    - Green
    - Amber
    - White

The decoded TTL signal is supplied from gate array of IC201 by open collector which connect to the brightness and contrast controls then it convert to digital to analog voltage of 0 to 1.0V level so that it is separated from the brightness and contrast circuit.

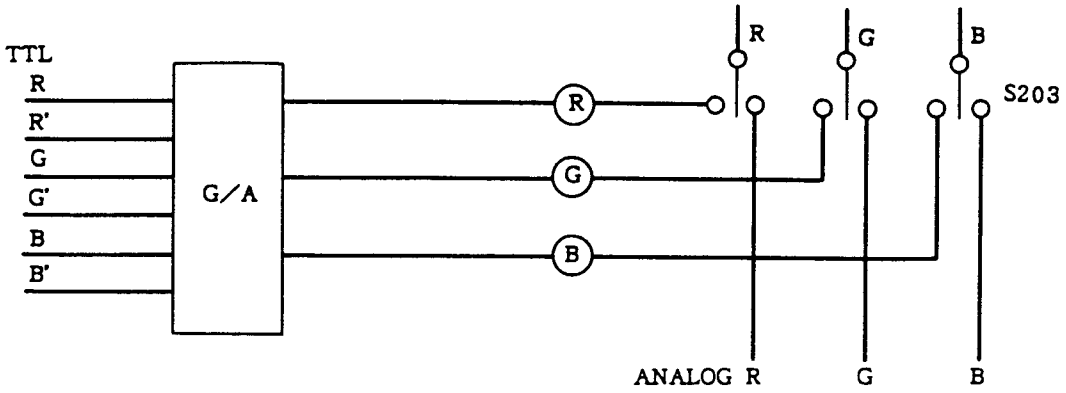
(2) – 2 The analog singal is directly applied to the pre – amplifier of IC202 via S203 which signal is controled to bias and gain by brightness and contrast controls then it amplified by IC202.

And amplified signal controled by correct current for each frequency range which get the constanlty brightness.

(3) Main Amplifier

The output of pre – amplifier is applied to the cascade amplifier of Q6□1, 6□2 which amplified by SEPP buffer of Q6□3, 6□4 and they produce to cathode of CRT with 40Vp – p level.

〈SIGNAL SELECTOR BLOCK〉



3) SYNC. SIGNAL

(1) Available Sync. Signal

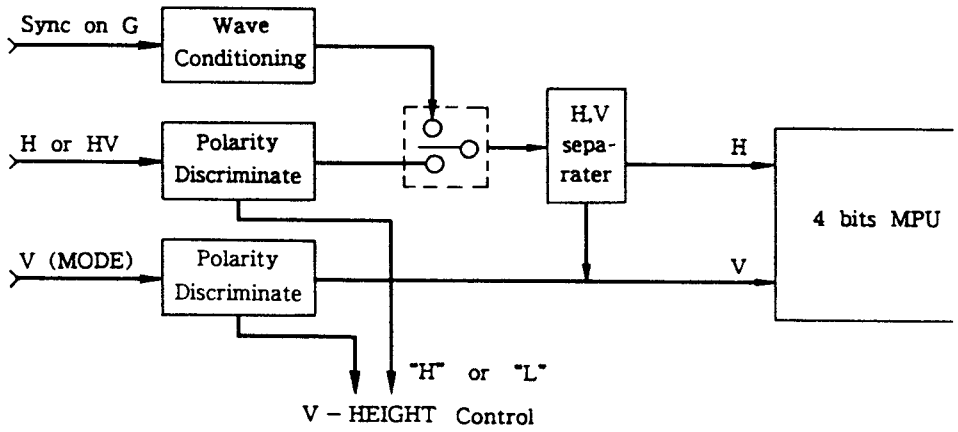
a. Separate TTL with Positive or Negative Polarity.

b. Composite TTL with Positive or Negative Polarity.

c. Sync. on Green with 0.3V Analog Level.

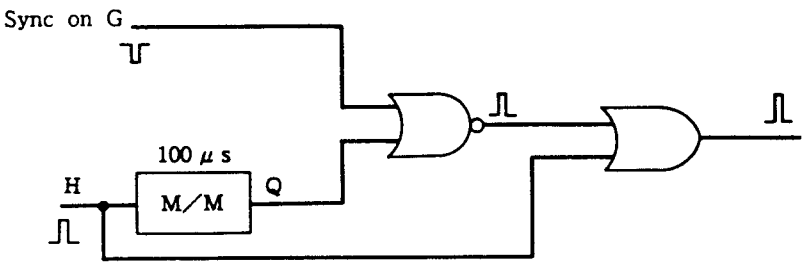
(2) Sync. Polarity Discriminate Circuit

Above sync. signals are converted to the DC level signal which input to the MPU (Micro Processor Unit) and they use for the control signal of V – Height at preset mode.



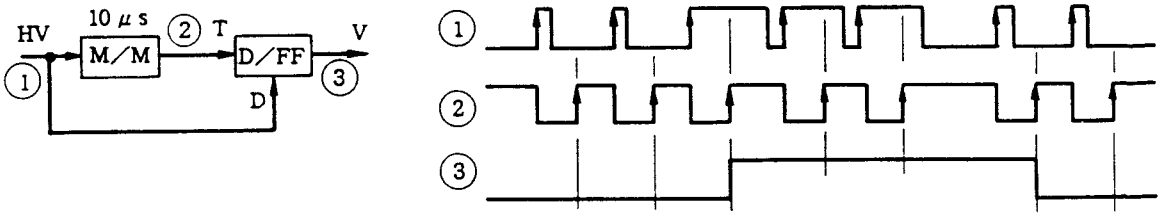
4) SYNC. ON GREEN DETECT CIRCUIT

Normaly, in case of horizontal separate sync. with TTL level which sync. pulse protect to the sync. on green signal by exclusive or gate after mono stable multi vibrator show as below. However, in case of sync. on green signal which pulse through the above exclusive or gate, so it output to the sync. on green signal.



5) SYNC. SEPARATE CIRCUIT

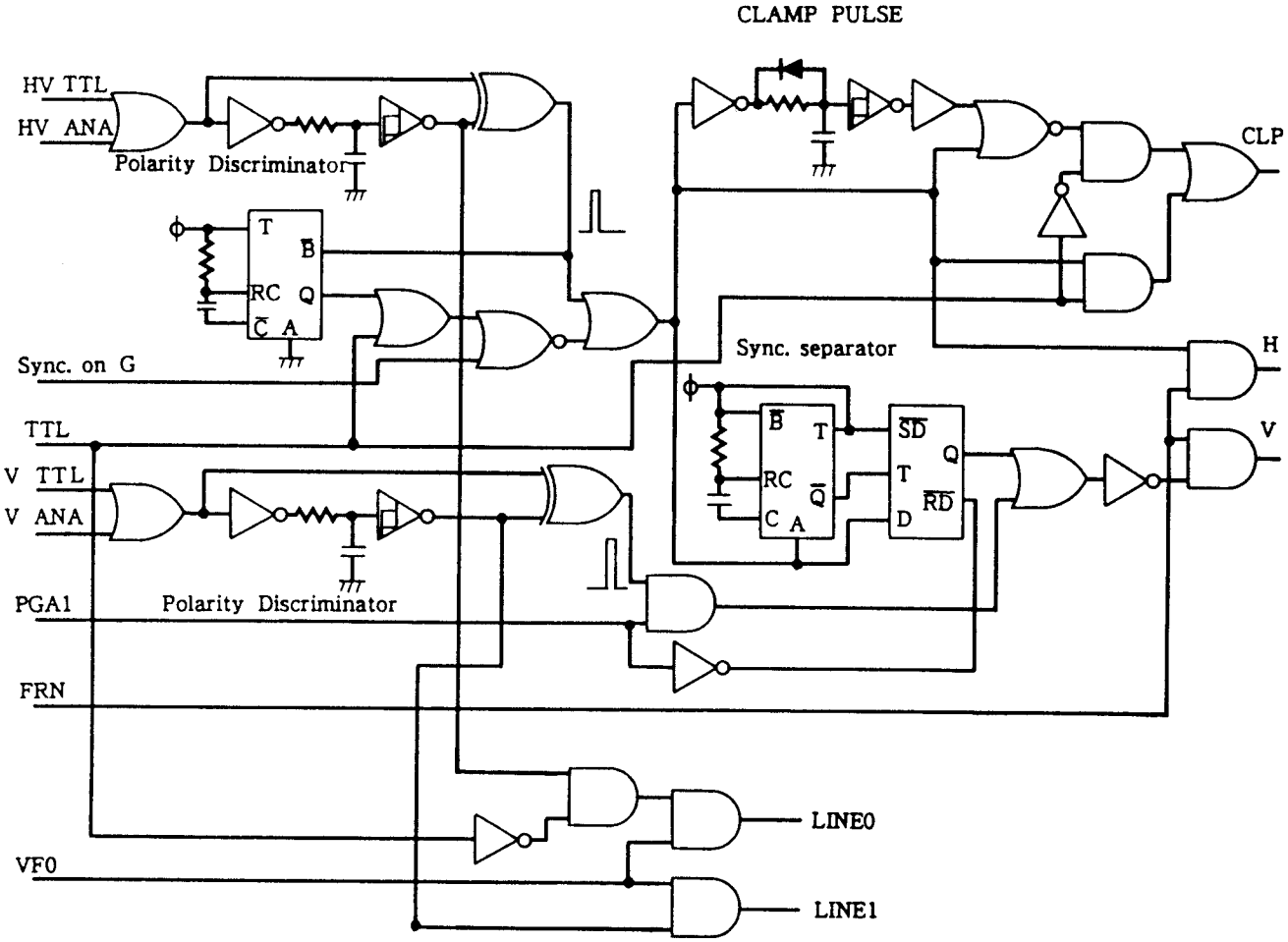
The sync. separate from composite sync. signal is separated by digital circuit of shown as below which get the high resolution and stabilized operation.



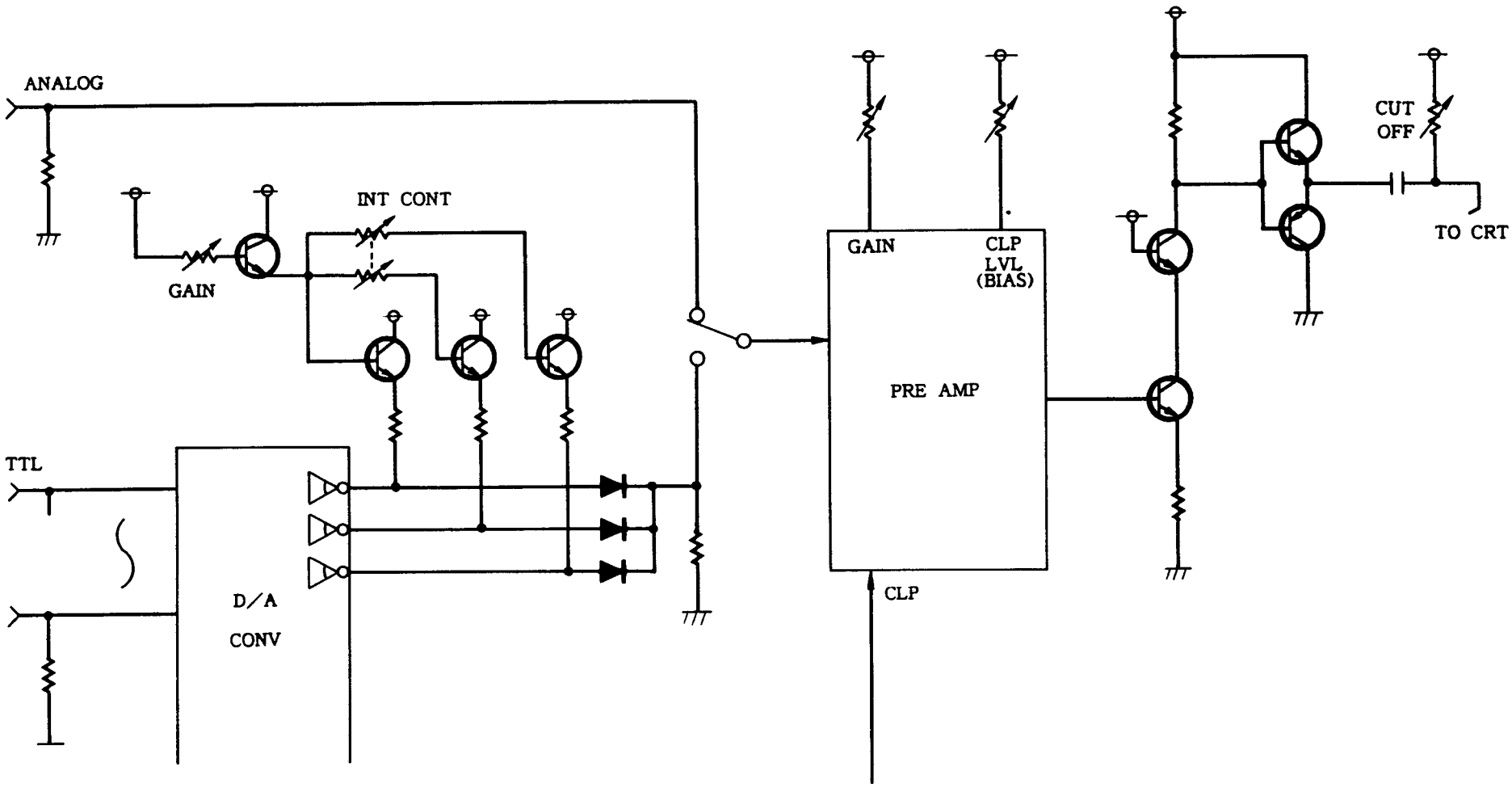
6) BRIGHTNESS CONTROL

The BRIGHT and CONTRAST (GAIN) controls are operate to as follows :

		ANALOG	TTL
CONTRAST (GAIN)	◑	GAIN CONTROL	TOTAL GAIN
BRIGHT	☼	BIAS CONTROL	LOW INT. GAIN



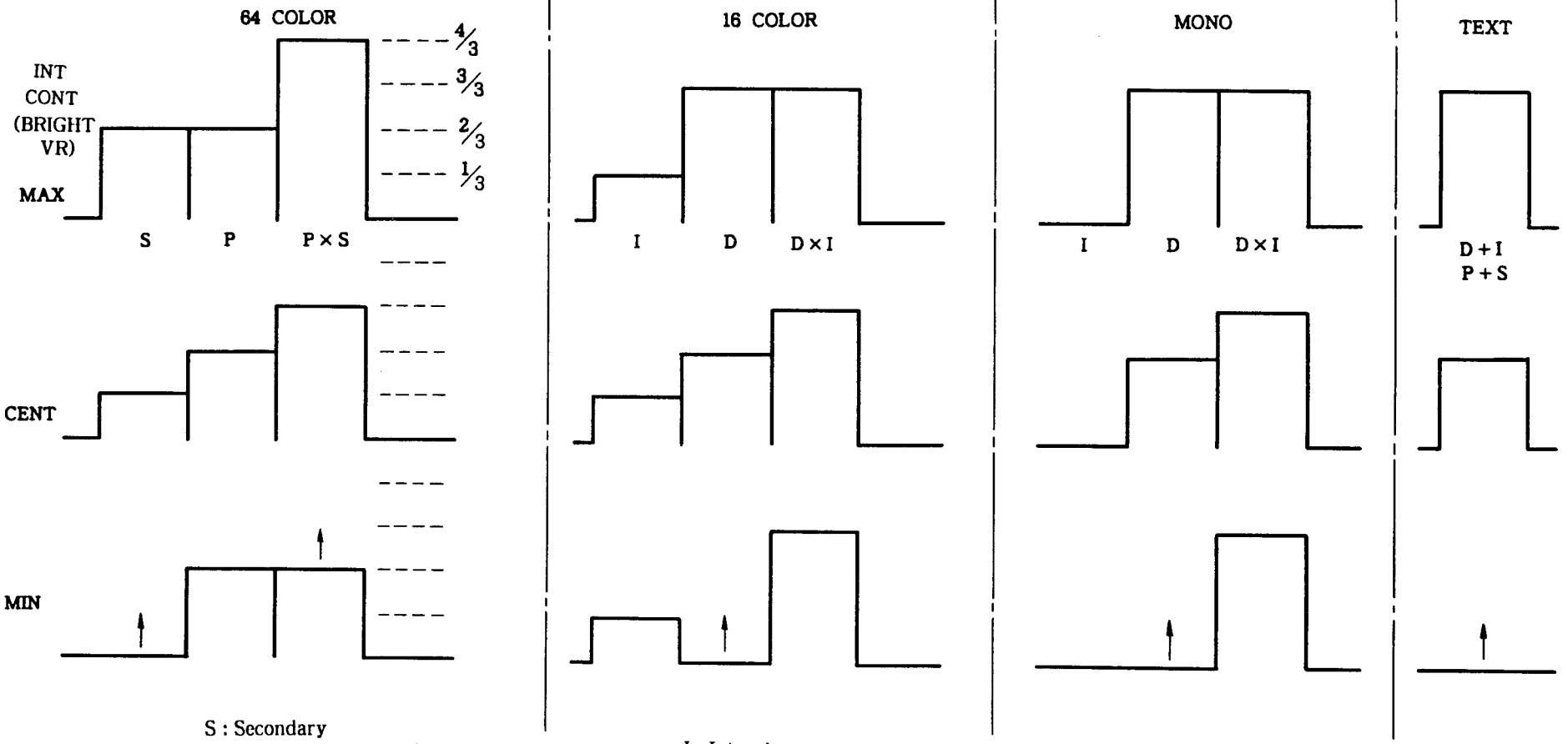
〈SIGNAL CONDITIONING CIRCUIT – 1〉



〈SIGNAL CONDITIONING CIRCUIT – 2〉

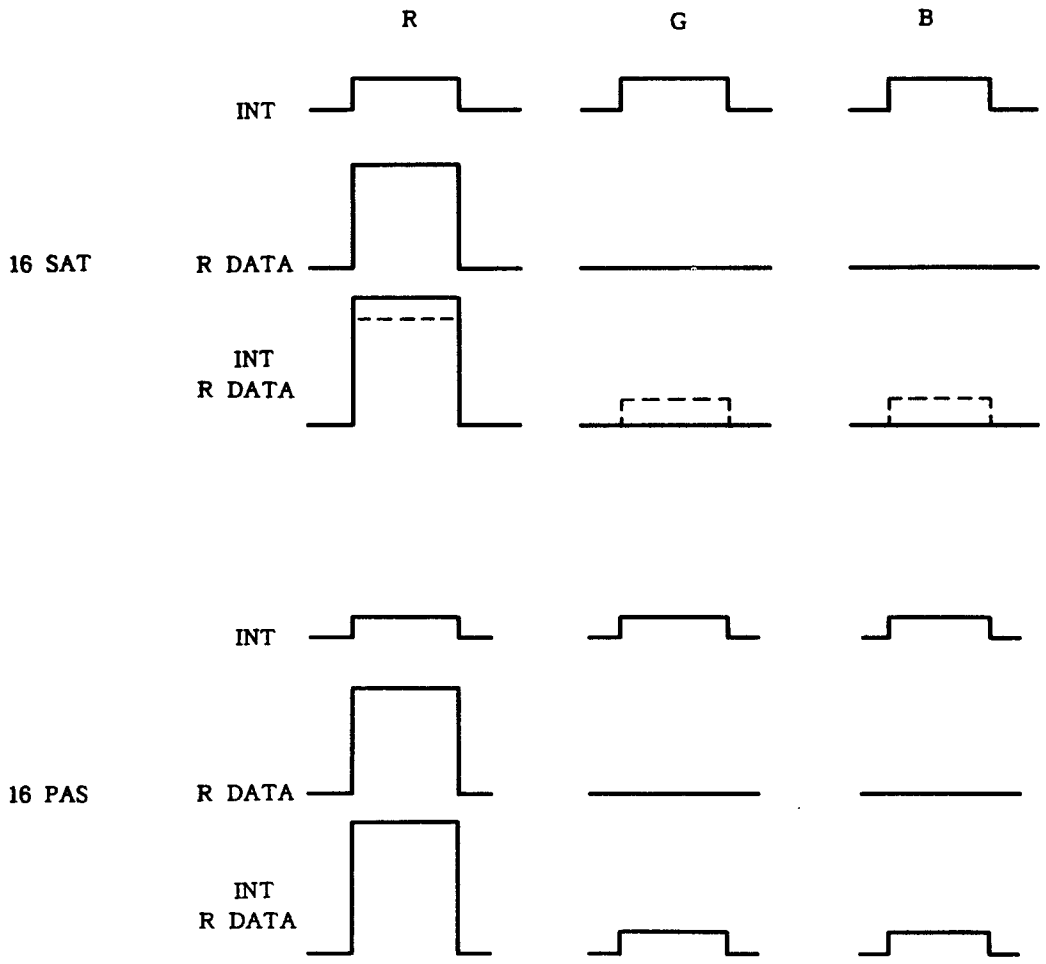
⟨TTL COLOR WAVE FORM⟩

COLOR : 64 COLOR, 16 SAT. COLOR, 16 PAS. COLOR, 8 COLOR
(MONO GREEN)
TEXT : AMBER, WHITE, GREEN



S : Secondary
P : Primary

I : Intensity
D : Data (R, G, B)


R
G
B
INT
16 SAT
R DATA
INT
R DATA
INT
16 PAS
R DATA
INT
R DATA

2.5 MPU

1) MODE SELECT CIRCUIT

The signal mode is determined by conditions of frequency, signal polarity, signal type and position of mode selection switch.

The mode selection is controled by 4bits MPU of IC209 which get the optimum raster condition in the wide frequency range.

When the mode select switch set up the "Preset" position, the monitor is fully compatible to IBM P/C.

The block diagram of MPU is shown as Fig. 2 – 1.

Each condition of CGA, MDA, PGC or VGA is discriminated by polarity and type of sync. signal which condition is controled by IC209 and it automatically control to the raster size, position and brightness at "Preset" position.

In case of select to "Preset" mode with input to the IBM P/C signal, it get the optimum raster condition without any adjustments.

The horizontal frequency is encoded to 2bits signal which use for the selection signal of linearity capacitor (Cs).

2) FREQUENCY DISCRIMINATE CIRCUIT

The construction of hard ware is shown as Fig. 2 – 2.

The vertical sync. signal is interrupt "1" after divided to 1/4 of horizontal frequency.

The internal clock generator of MPU generate to the timer interrupt of 0.5ms sync.

The vertical sync. frequecny (FV) is counted by formula of 4 – 1 which count to the number (Vc) of timer interrupt during 1 period in vertical interrupt.

$$Fv = 1/\ (0.5 \times 10^{3} \times Vc) = 2000/Vc\ [Hz] \quad \cdots\cdots 4-1$$

Vc in formula is counted by two words soft ware of RAM.

The horizontal frequency (FH) is counted by formula of 4 – 2 which count to the number of horizontal interrupt (Hc) during the delayed 5ms after finished vertical interrupt to next 5ms.

$$FH = 4Hc/\ (5 \times 10^{-3}) = 4Hc/5\ [KHz] \quad \cdots\cdots\cdots 4-2$$

The counted frequency is divided to the 4 ranges shown as table 2.

The divided horizontal frequency gave the enough interrupt processing time.

The min. period of interrupt is same as horizontal interrupt which becomes min. at 35.5KHz of horizontal frequecny.

The delay time of 5msec after finishing the vertical interrupt is prevent to miss – operation for a kind of equivalent pulse in composite sync. signal. (Fig. 2 – 3)

3) SYNC. TYPE DISCRIMINATE CIRCUIT

The MPU has sync. type discriminate function which shown as Fig. 2 – 4.

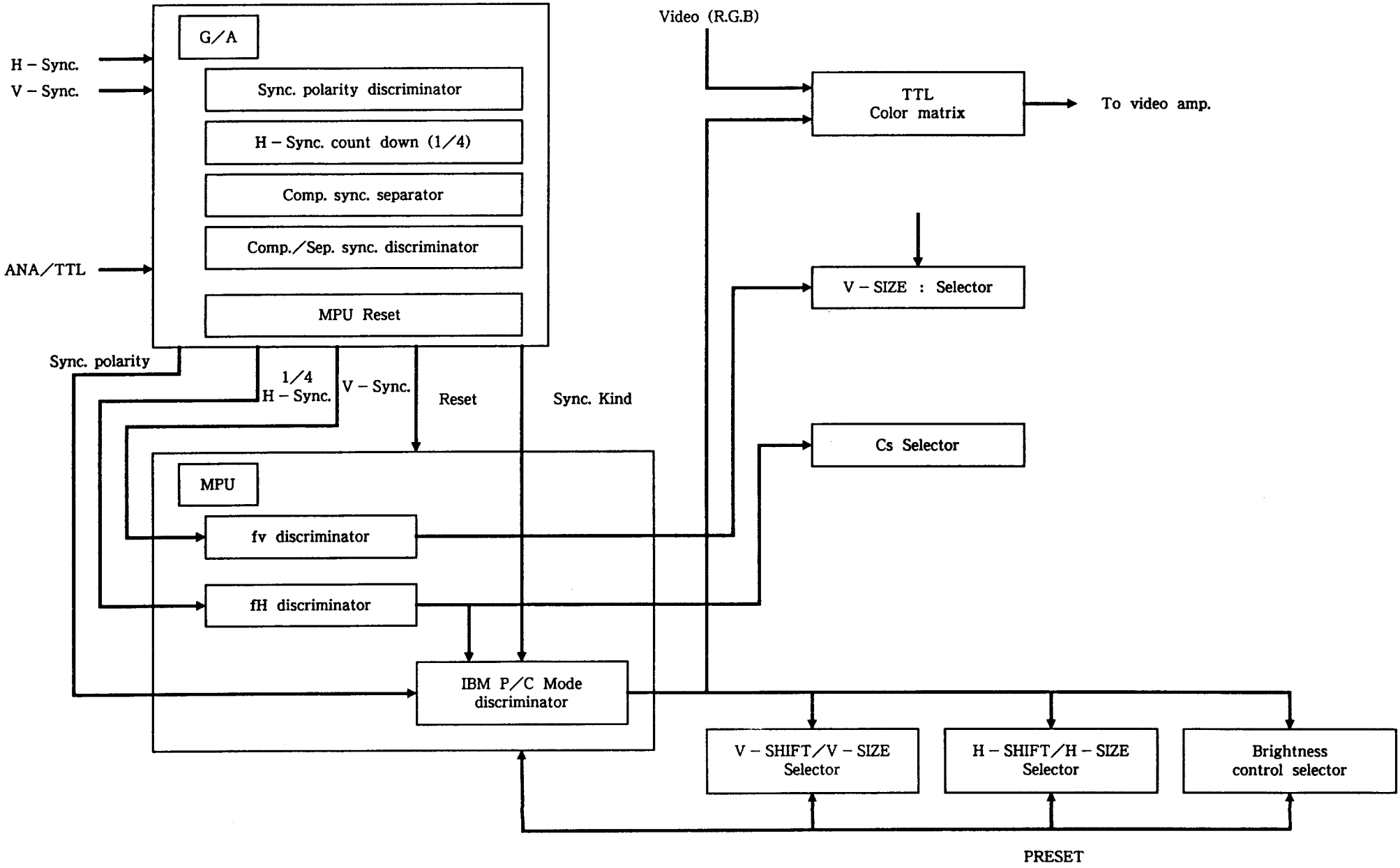
4) THE FREQUENCY DETECTING CIRCUIT

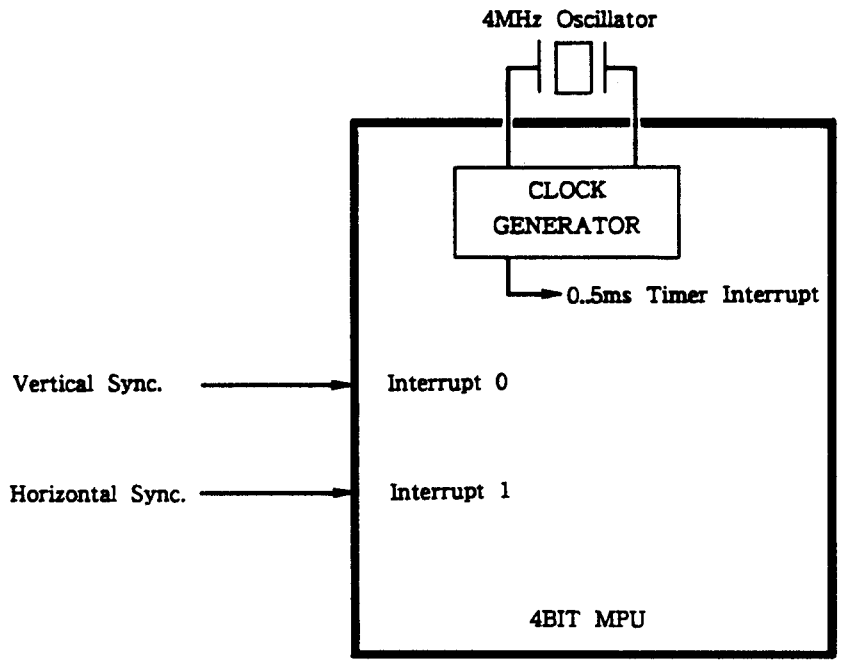
The sync. frequency is detected by MPU which detect to more than 2KHz of horizontal frequency and more than 4Hz of vertical frequency.

When the signal board generate to the unstable signal, the MPU output to the blanking pulse which prevent to the abnormal raster.

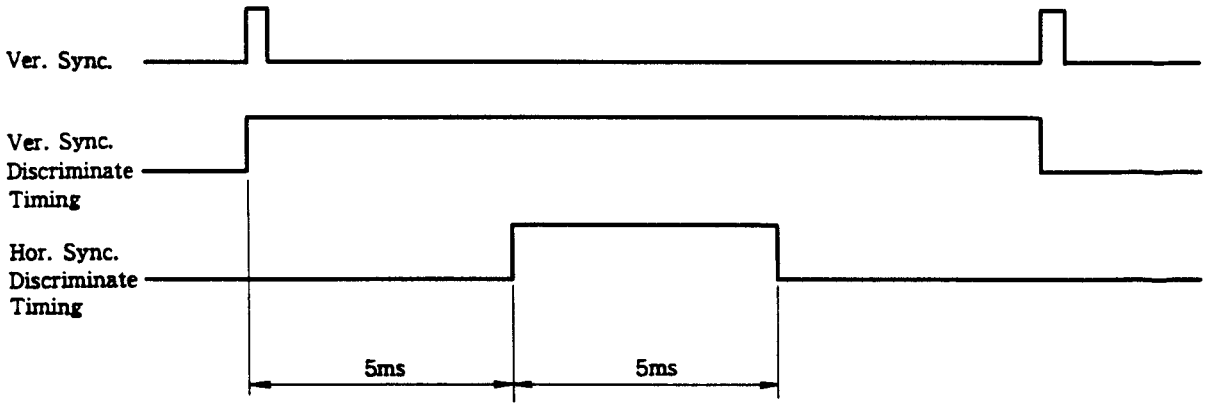
The flow chart is shown as Fig. 2 – 5.

〈Fig. 2 – 1 BLOCK DIAGRAM OF SIGNAL PROCESSOR〉





〈 Fig. 2 – 2 Frequency Discriminate Circuit 〉



〈 Fig. 2 – 3 Timing Chart of Frequency Discriminate 〉

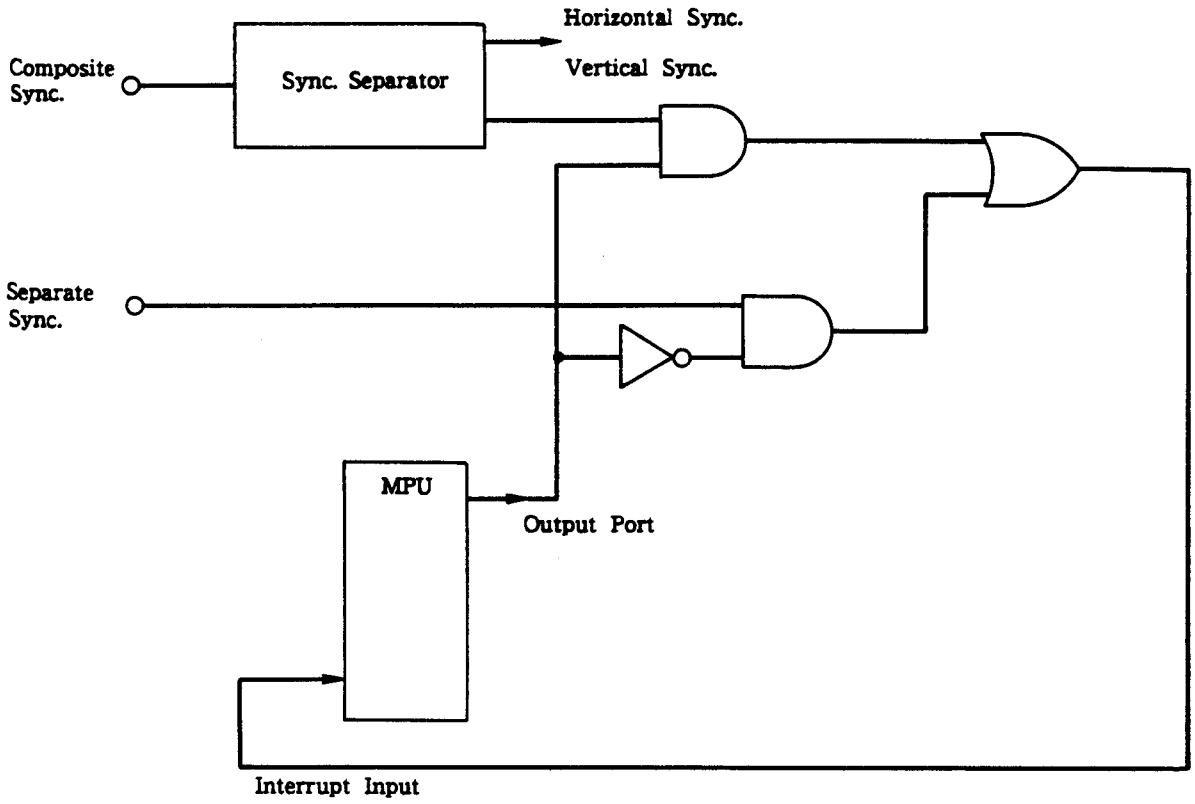
Range	Span	Resolution
V50	50 ~ 55Hz	1.2Hz at 50Hz
V60	55 ~ 65Hz	1.8Hz at 60Hz
V70	65 ~ 80Hz	2.5Hz at 70Hz
V80	80 ~ 87Hz	4.0Hz at 85Hz

- Sorting Table of Vertical Sync.-

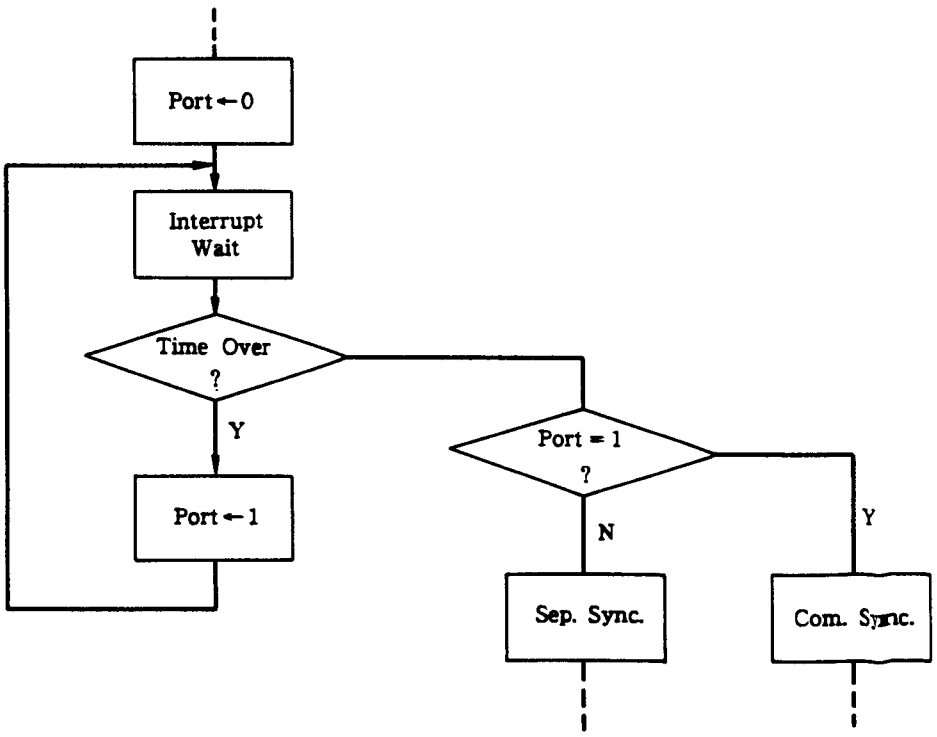
Range	Span
H15	15.7 ~ 19KHz
H22	19 ~ 23KHz
H25	23 ~ 28KHz
H30	28 ~ 35.5KHz

- Sorting Table of Horizontal Sync.-

〈 Table 2 Sorting Table of Frequency 〉

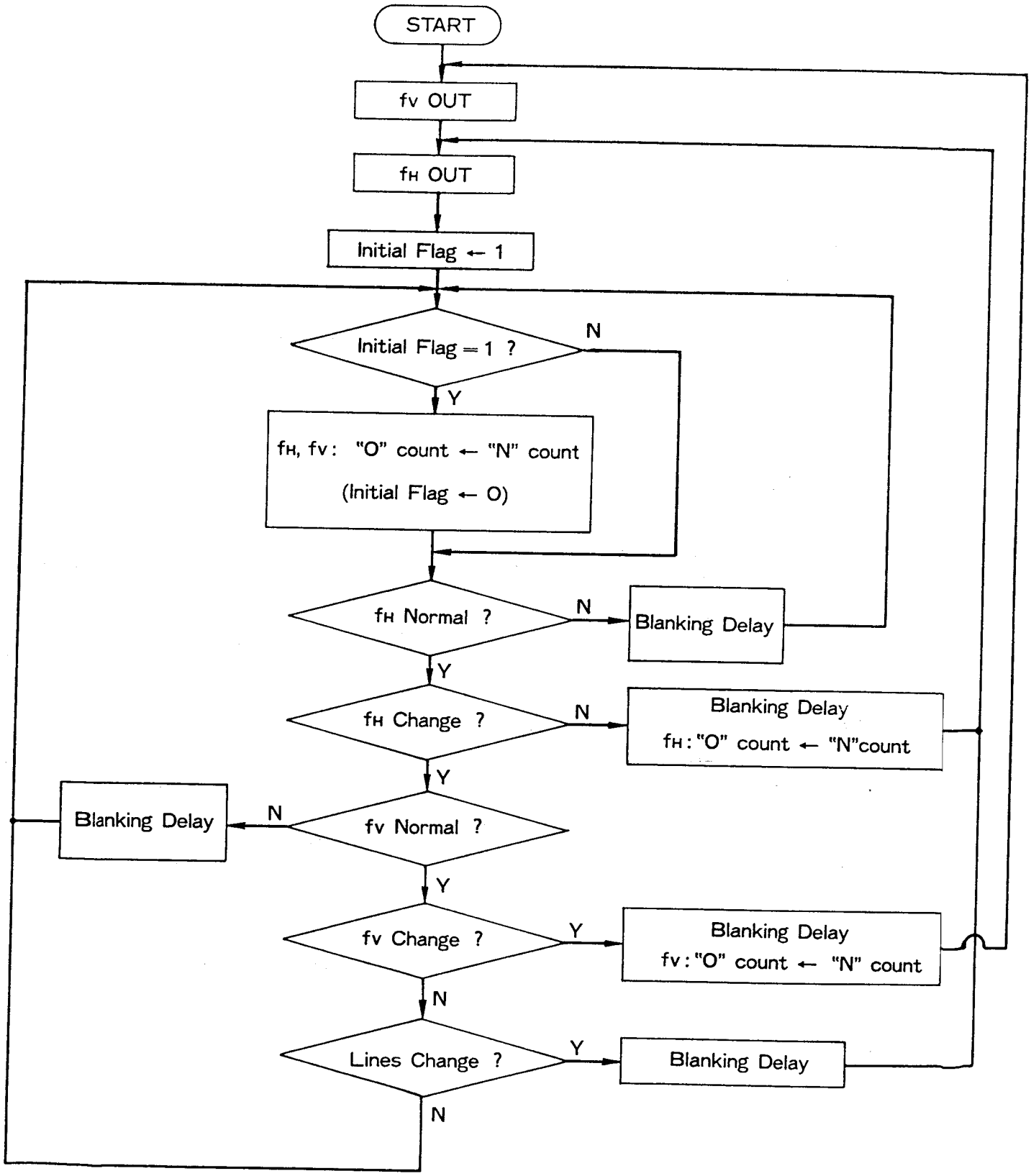


〈 Fig. 2 – 4 Synchronous Type Discriminate Circuit 〉

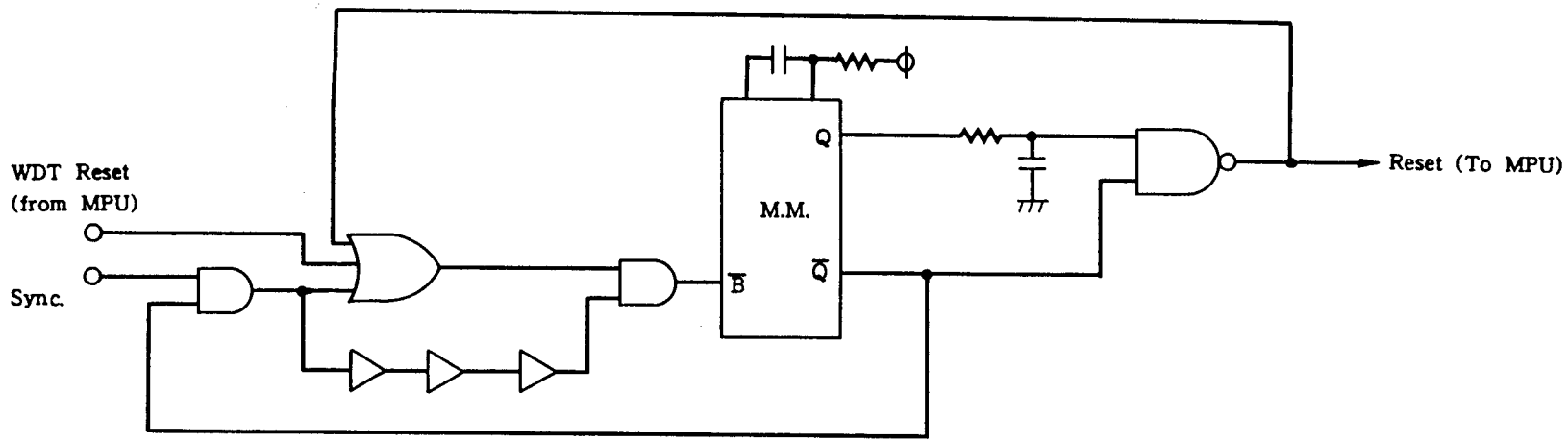


〈 Flow Chart of Sync. Type Discriminate 〉

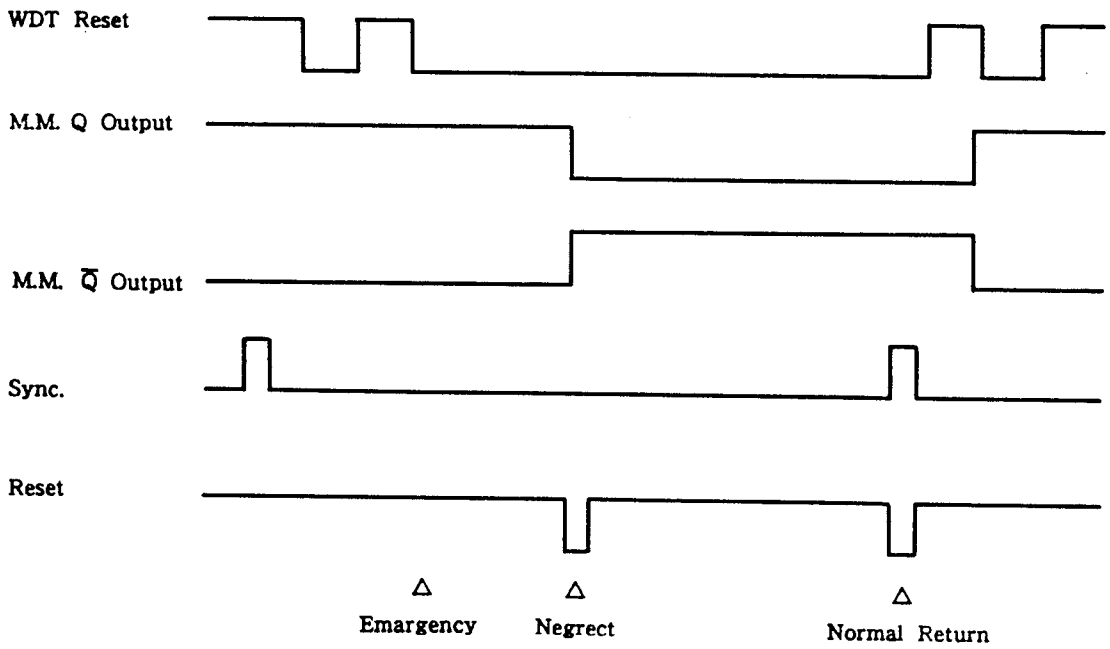
〈 Fig. 2 – 5 AUTO TRACKING FLOW 〉



Detective range of lines; $\overline{AUTO} * \overline{H30}$
Detective range of fH ; | "O" count – "N" count | >2KHz
Detective range of fv ; | "O" count – "N" count | >4Hz



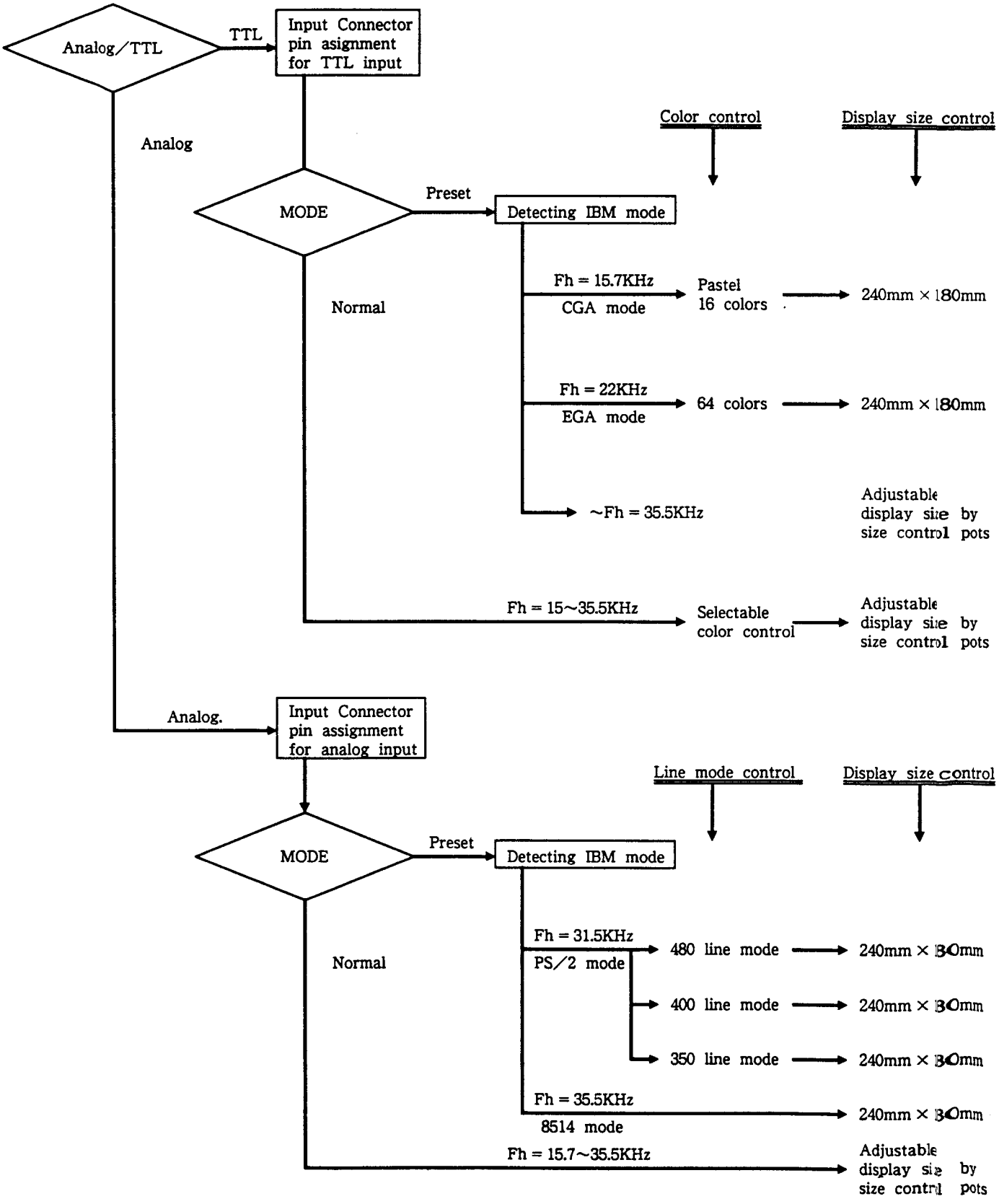
〈Watch Dog Timer Circuit〉



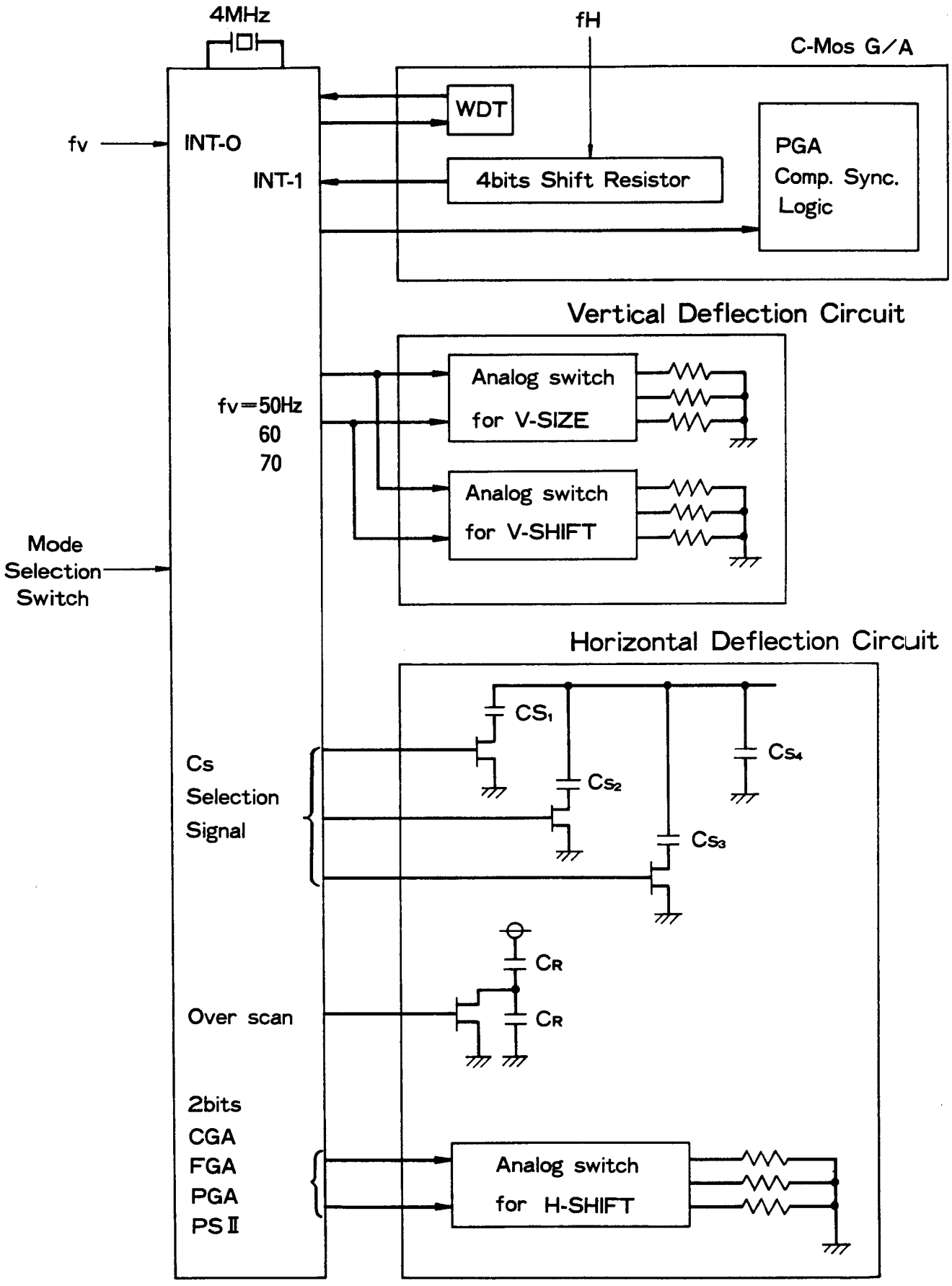
〈Time Chart of Reset Circuit〉

5) MODE CONTROL

The monitor has a input mode control function which is to select a video signal – either TTL or ANALOG, and at preset mode control position which is to be fully compatible with the IBM graphics adapter.



〈 H/W BLOCK FOR SELECTION CIRCUIT 〉

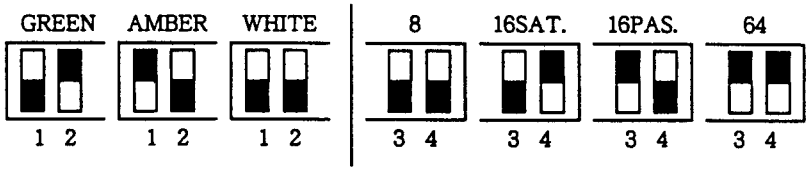


3. ADJUSTMENT PROCEDURE

3.1 PRESETTING FOR FA34 SERIES

CONTROL	DESCRIPTION		PRESETTING
VR201	SUB – CONT	VR	CENTER
VR202	SUB – BRIGHT	VR	CENTER
VR – PCC	S – PCC	VR	CENTER
VR2R1	R – DRIVE	VR	CENTER
VR2B1	B – DRIVE	VR	CENTER
VR272	BRIGHT	VR	CLICK POSITION
VR271	GAIN	VR	MAX.
S201	SERVICE	SW	CENTER
S203	TTL/ANALOG	SW	ANALOG
S204	MODE	SW	PRESET
S205	TEXT	SW	COLOR
S206	SCAN	SW	NORMAL
S207	COLOR	SW	UPPER (OPEN)
VR601	G1 – ADJ	VR	FULLY COUNTER CLOCK WISE
VR6R1	R – CUT – OFF	VR	FULLY COUNTER CLOCK WISE
VR6G1	G – CUT – OFF	VR	FULLY COUNTER CLOCK WISE
VR6B1	B – CUT – OFF	VR	FULLY COUNTER CLOCK WISE
VR582	H – HOLD	VR	CENTER
VR5HV	B4 – ADJ	VR	CENTER
VR5WC	H – SIZE – C	VR	CENTER
VR5WE	" – E	VR	CENTER
VR5WP	" – P	VR	CENTER
VR5WN	" – N	VR	CENTER
VR5PC	H – SHIFT – C	VR	CENTER
VR5PE	" – E	VR	CENTER
VR5PP	" – P	VR	CENTER
VR5PN	" – N	VR	CENTER
VRHSZ	H – SIZE	VR	CLICK POSITION
VRHPA	H – SHIFT	VR	CLICK POSITION
S251	H – POSI – 1	SW	CENTER
S252	H – POSI – 2	SW	CENTER
VR401	V – HOLD	VR	CENTER
VR4S7	V – SIZE – 1	VR	CENTER
VR404	V – LIN	VR	CENTER
VR4P1	V – SHIFT – 1	VR	CENTER
VRVSZ	V – SIZE	VR	CLICK POSITION
VRVPS	V – SHIFT	VR	CLICK POSITION
FBT SCREEN DIP SW			MIN. 8 COLORS/WHITE

COLOR MODE SELECT ■ : SWITCH POSITION



3.2 ADJUSTMENT PROCEDURE FOR FA34 SERIES

ITEM	SIGNAL & NO.	CONTROL	ADJUSTMENT
1. FREE RUNNING FREQUENCY 1) HORIZONTAL 2) VERTICAL	WHITE ①	S201 VR582 VR401	1) SET UP S201 TO MAKE THE FREE RUNNING CONDITION. 2) ADJUST THE HORIZONTAL FREQUENCY TO 25.1 ± 0.2KHz BY VR582 WHICH PICKED UP FROM RED LEAD OF DY. 3) ADJUST THE VERTICAL FREQUENCY TO 53.0 ± 1.0Hz BY VR401 WHICH PICKED UP FROM BROWN LEAD OF DY. 4) BACK TO THE NORMAL (CENTER) POSITION OF S201 AFTER ABOVE ADJUSTMENT. ※MEASURED BY FREQ. COUNTER
2. B4 VOLTAGE	NO VIDEO ⑬	VR5HV	1) CONNECT DC VOLTMETER BETWEEN TPB4 AND CHASSIS GND. 2) ADJUST VOLTAGE TO 113V ± 1V BY VR5HV.
3. SCREEN VOLTAGE	NO VIDEO ⑬	SCREEN	ADJUST SCREEN VOLTAGE FOR A 660 ± 5V BETWEEN TPSC AND CHASSIS GND.
4. BRIGHTNESS	NO VIDEO ⑬	VR202 (SUB – BRT)	SET UP VR202 TO ABOUT 40% POSITION FROM MIN. POSITION.
5. CUT – OFF (FOR B22 PHOSPHOR)

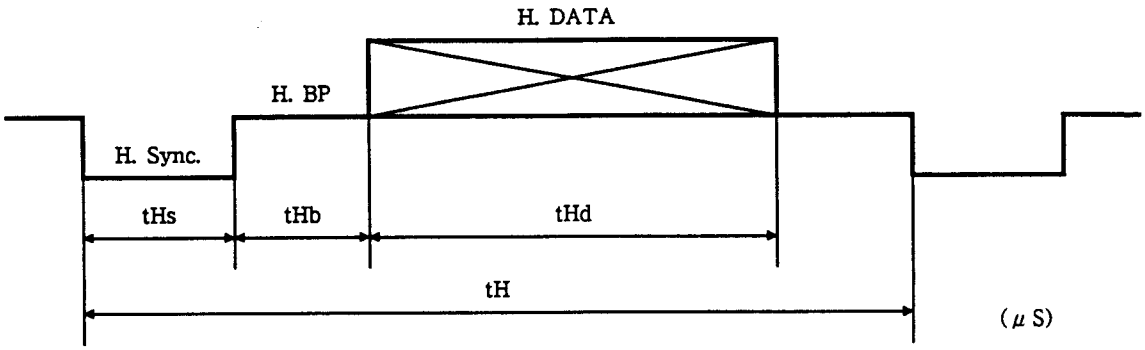
ITEM	SIGNAL & NO.	CONTROL	ADJUSTMENT
6. WHITE BALANCE (FOR B22 PHOSPHOR)	WHITE ⑧	VR2R1 VR2B1	ADJUST WHITE BALANCE BY VR2R1 AND VR2B1 TO FOLLOWING VALUES WHICH MEASURED BY COLOR ANALYZER. X = 0.283 ± 0.005 Y = 0.297 ± 0.005 AT 115nits X = 0.283 ± 0.010 Y = 0.297 ± 0.010 AT 20nits
7. CUT – OFF AND WHITE BALANCE (FOR BL9 PHOSPHOR)	WHITE ⑧	S201 H – SIZE V – SIZE VR6R1 VR6G1 VR6B1	1) ADJUST HORIZONTAL WIDTH TO ABOUT 240mm BY H – SIZE CONTROL.(FRONT) 2) ADJUST VERTICAL HEIGHT TO ABOUT 180mm BY V – SIZE CONTROL.(FRONT) 3) TURN VR6R1, 6G1 AND 6B1 TO MIN. POSITION.
	WINDOW ⑧		4) ADJUST WHITE BALANCE TO FOLLOW – ING VALUES BY VR6R1, 6G1, 6B1 AND VR201 AT ABOUT 20nits OF LUMI – NANCE WHICH MEASURED BY COLOR ANALYZER. X = 0.283 ± 0.010 Y = 0.297 ± 0.010 5) ADJUST VR201 TO ABOUT 85nits OF LUMINANCE. 6) ADJUST VR2R1 AND 2B1 TO GET FOLLOWING WHITE COORDINATION AT ABOUT 85nits OF LUMINANCE WHICH MEASURED BY COLOR ANALYZER. X = 0.283 ± 0.005 Y = 0.297 ± 0.005
	WHITE ⑧	VR601	7) ADJUST VR601 AS BELOW CONDITIONS. BRIGHT : CENTER } DISAPPEAR GAIN : MAX. } BACK RASTER BRIGHT : MAX. } DIMLY GAIN : MAX. } BACK RASSTER
8. BRIGHTNESS	WINDOW ⑧	GAIN BRIGHT H – SIZE H – PHASE V – SIZE V – POSI VR201	1) TURN GAIN CONTROL TO MAX. POSITION. 2) TURN BRIGHT, H – SIZE, H – PHASE, V – SIZE AND V – POSI CONTROL TO CENTER POSITION. 3) ADJUST VR201 (SUB – CONT) TO ABOUT 115nits (BL9 = 80nits) OF LUMINANCE WHICH MEASURED BY LUMINANCE METER.

ITEM	SIGNAL & NO.	CONTROL	ADJUSTMENT
9. FOCUS	CHARACTOR ⑧	FOCUS	ADJUST FOCUS CONTROL ON FBT TO GET OPTIMUM FOCUS.
10. SIDE P.C.C.	WHITE ⑧	VRPCC	ADJUST VRPCC TO GET STRAIGHTLY RASTER.
11. HORIZONTAL WIDTH	WHITE ⑧	VR5WN	1) SET UP BRIGHT CONTROL TO MAX. POSITION. 2) ADJUST HORIZONTAL WIDTH TO ABOUT 240mm BY VR5WN.
12. H – PHASE H – POSITION	WHITE ⑨	GAIN VR5PN S251,252	1) ADJUST BRIGHT AND GAIN CONTROLS TO GET DIMLY BACK RASTER. 2) ADJUST VIDEO PHASE TO SETTLED ON CENTER OF BACK RASTER BY VR5PN. 3) ADJUST HORIZONTAL POSITION TO SETTLED ON CENTER OF BEZEL BY S251 AND S252.
13. HORIZONTAL WIDTH AND POSITION	WHITE ⑪	VR5WP VR5PP	1) ADJUST HORIZONTAL WIDTH TO ABOUT 240mm BY VR5WP. 2) ADJUST HORIZONTAL POSITION TO SETTLED ON CENTER OF BEZEL BY VR5PP.
14. HORIZONTAL WIDTH AND POSITION	WHITE ②	VR5WC VR5PC	1) ADJUST HORIZONTAL WIDTH TO ABOUT 240mm BY VR5WC. 2) ADJUST HORIZONTAL POSITION TO SETTLED ON CENTER OF BEZEL BY VR5PC.
15. HORIZONTAL WIDTH AND POSITION	WHITE ④	VR5WE VR5PE	1) SET UP INPUT SIGNAL SWITCH TO TTL POSITION. 2) ADJUST HORIZONTAL WIDTH TO ABOUT 240mm BY VR5WE. 3) ADJUST HORIZONTAL POSITION TO SETTLED ON CENTER OF BEZEL BY VR5PE.
16. VERTICAL LINEARITY	CROSS HATCH ⑥	VR404	ADJUST VR404 TO GET EQUAL SPACING BETWEEN TOP AND BOTTOM OF CROSS HATCH.
17. VERTICAL HEIGHT AND POSITION	WHITE ⑥	VR4S7 VR4P1	1) ADJUST VERTICAL HEIGHT TO ABOUT 180mm BY VR4S7. 2) ADJUST VERTICAL POSITION TO SETTLED ON CENTER OF BEZEL BY VR4P1.

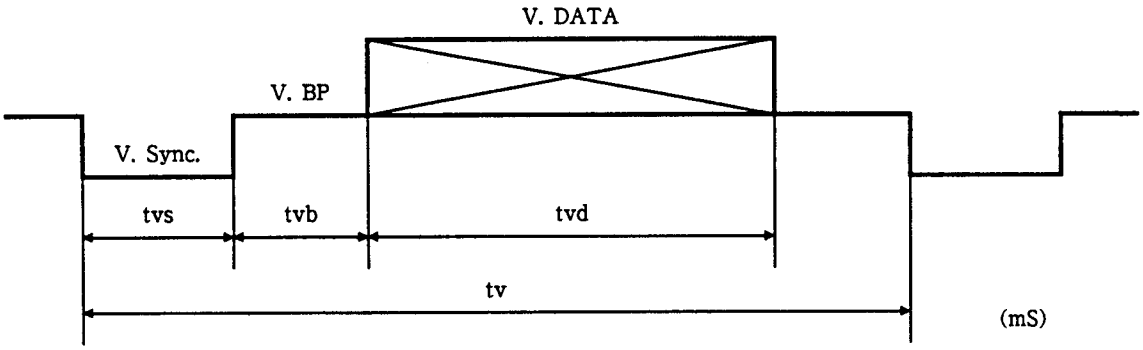
ITEM	SIGNAL & NO.	CONTROL	ADJUSTMENT
18. BRIGHTNESS	WINDOW ⑧	VR201	1) SET UP INPUT SIGNAL SWITCH TO ANALOG POSITION. 2) ADJUST LUMINANCE TO 115 (BL9 = 85) ± 3nits BY VR201 WHICH MEASURED BY LUMINANCE METER. 3) SET UP INPUT SIGNAL SWITCH TO TTL POSITION.
	WINDOW ④	VR202	4) ADJUST LUMINANCE TO 125 (BL9 = 80) ± 3nits BY VR202.
19. X – RAY PROTECTOR	WHITE ④		1) APPLY TO DC 50 ± 1V BETWEEN TPX AND CHASSIS GND. THEN CHECK TO OPERATE THE X – RAY PROTECTION CIRCUIT. 2) TURN OFF THE NONITOR. 3) RECHECK THE NORMAL RASTER, AFTER 5sec. FROM TURN OFF.

3.3 TIMING CHART

(1) HORIZONTAL (1H)



(2) VERTICAL (1V)



(3) SINGAL TYPE

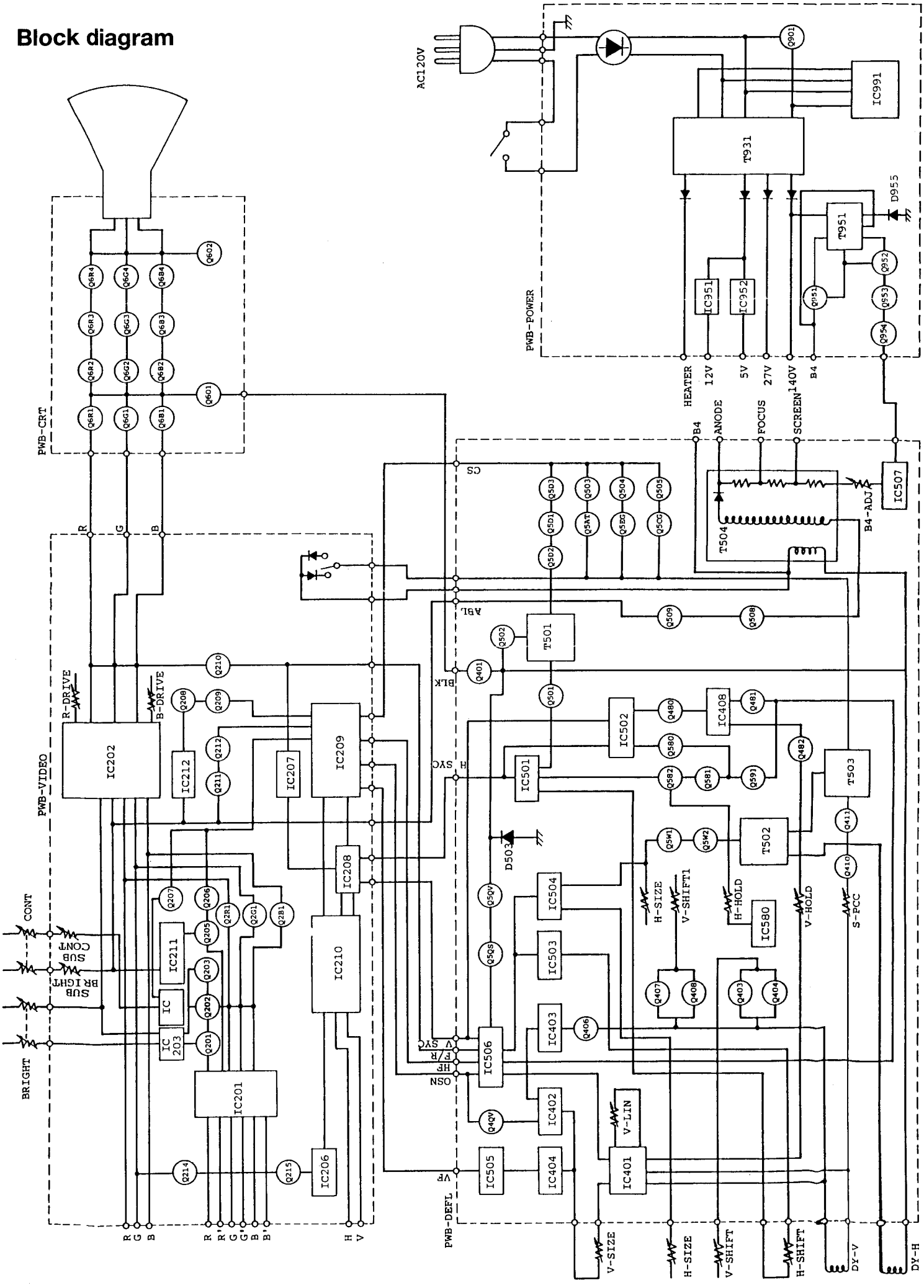
SIGNAL		
VIDEO	A : ANALOG	T : TTL – 64, – 16, – 8 AG : ANALOG with sync.
HD	P : Positive N : Negative C : Composite sync. without selation S : Composite sync. with selation	
VD	P : Positive N : Negative	

(4) DATA TABLE OF TIMING CHART

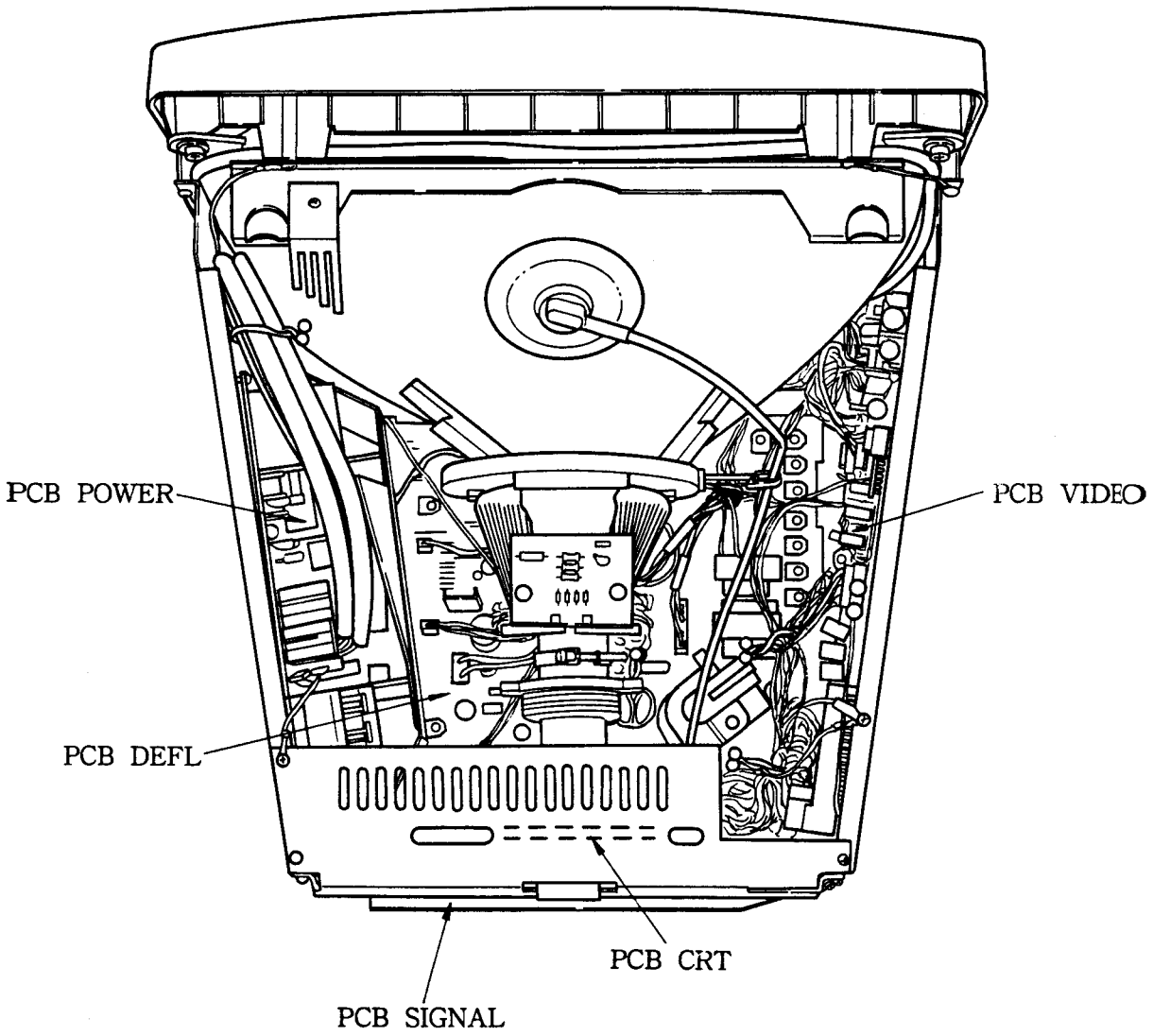
NO.	Dot in t_{Hd}	t_H	t_{HS}	t_{Hb}	t_{Hd}	tv	tvs	tvb	tvd	I/NI	H.sync	V.sync	MODE	REMARKS
①	790	40.00	5.200	3.200	31.60	16.67	0.080	0.760	15.72	NI	P	P	–	TEST
②	640	63.50	4.500	8.950	44.50	16.64	0.190	2.159	12.70	NI	P	P	–	CGA
③	640	63.50	4.500	4.500	52.30	16.64	0.190	0.762	15.62	NI	P	P	–	CGA
④	640	45.76	4.950	1.640	39.50	17.00	0.600	0.103	16.30	NI	P	N	–	EGA (CH.)
⑤	640	32.80	4.480	2.720	25.60	16.66	0.066	0.787	15.74	NI	C	–	H	PGA 480
⑥	640	32.80	4.480	2.720	25.60	16.66	0.066	2.099	13.12	NI	C	–	L	PGA 400
⑦	640	31.778	3.813	1.907	25.422	16.683	0.064	1.048	15.253	NI	N	N	–	PS2 480
⑧	720	31.778	3.813	1.907	25.422	14.268	0.064	1.111	12.711	NI	N	P	–	PS2 400
⑨	738	31.778	3.813	1.589	26.058	14.268	0.064	0.889	13.156	NI	N	P	–	PS2 400
⑩	720	31.778	3.813	1.907	25.422	14.268	0.064	1.907	11.122	NI	P	N	–	PS2 350
⑪	1024	28.153	3.920	1.250	22.80	11.500	0.113	0.577	10.810	I	P	P	–	PS2 35K
⑫	720	54.25	8.30	1.11	44.29	20.07	0.868	0.217	18.99	NI	P	N	–	MDA
⑬	640	28.571	2.116	3.175	21.164	15.00	0.086	1.114	13.714	NI	S	–	–	AppleMAC
⑭	640	31.778	3.813	1.907	25.422	20.000	0.077	1.258	18.304	NI	N	N	–	TEST50
⑮	640	31.778	3.813	1.907	25.422	14.286	0.055	0.898	13.074	NI	N	N	–	TEST70
⑯	640	31.778	3.813	1.907	25.422	14.286	0.064	1.111	12.711	NI	–	–	–	TESTAG
⑰	640	40.28	3.04	4.04	30.40	18.04	0.32	1.28	16.12	NI	N	N	–	PC9801
⑱	640	40.28	3.04	4.04	30.40	18.04	0.32	1.28	16.12	NI	N	N	–	PC9801
⑲	1120	30.45	1.77	2.93	23.41	12.50	0.15	0.41	11.87	I	N	N	–	PC98XA
⑳	640	46.40	4.95	2.40	39.50	17.00	0.60	0.103	16.30	NI	P	N	–	EGA (GRA.)
㉑	746	63.50	4.60	4.70	52.642	16.666	0.1905	0.666	15.619	NI	N	N	–	TEST
㉒	792	41.67	3.75	5.59	31.15	16.67	0.125	0.775	15.70	NI	P	P	–	TEST
㉓	738	31.746	2.50	3.20	25.046	16.666	0.0952	0.6032	15.873	NI	N	N	–	TEST

I : Interlace NI : Non Interlace

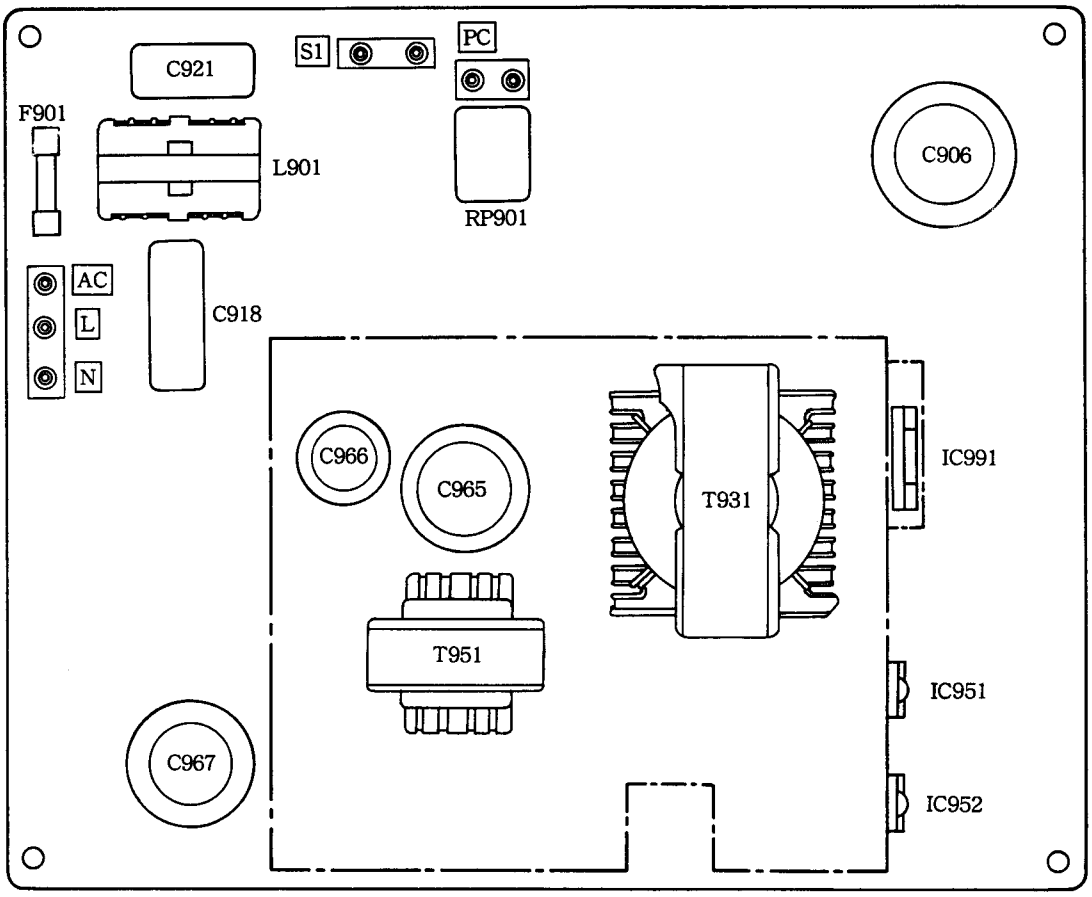
Block diagram



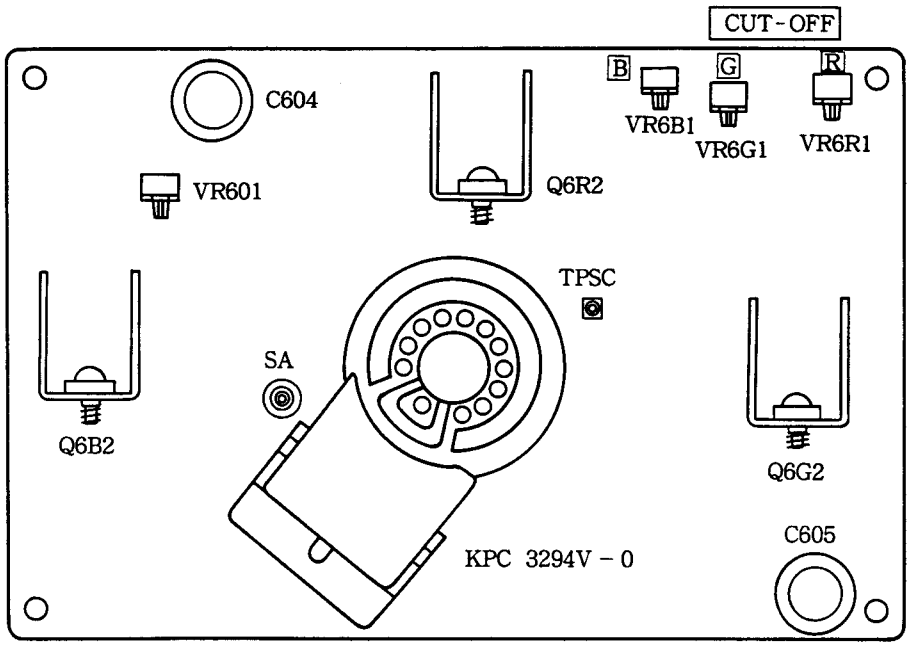
PCB LOCATION FOR FA34 SERIES



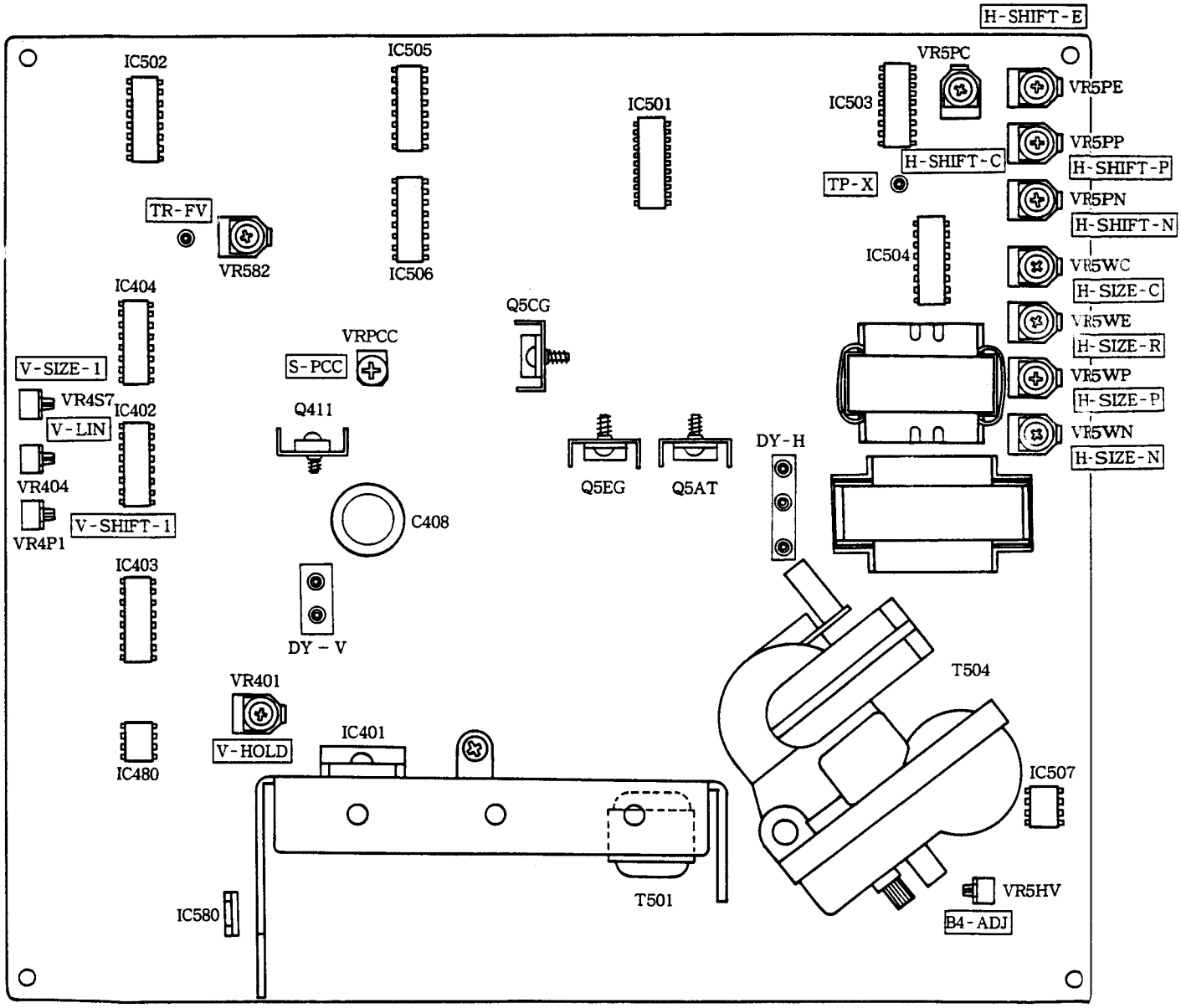
CONTROL LOCATION ON PCB POWER



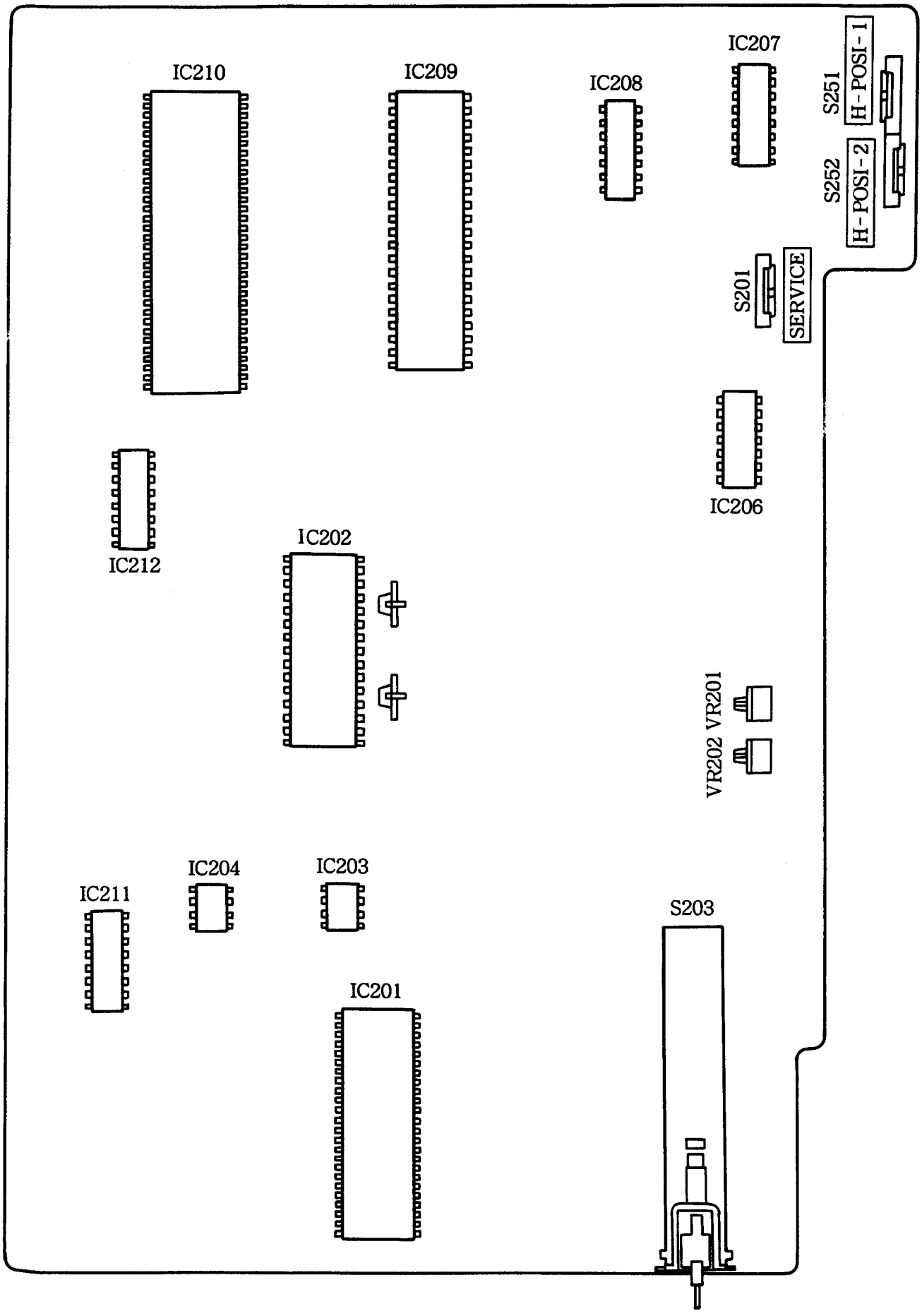
CONTROL LOCATION ON PCB CRT



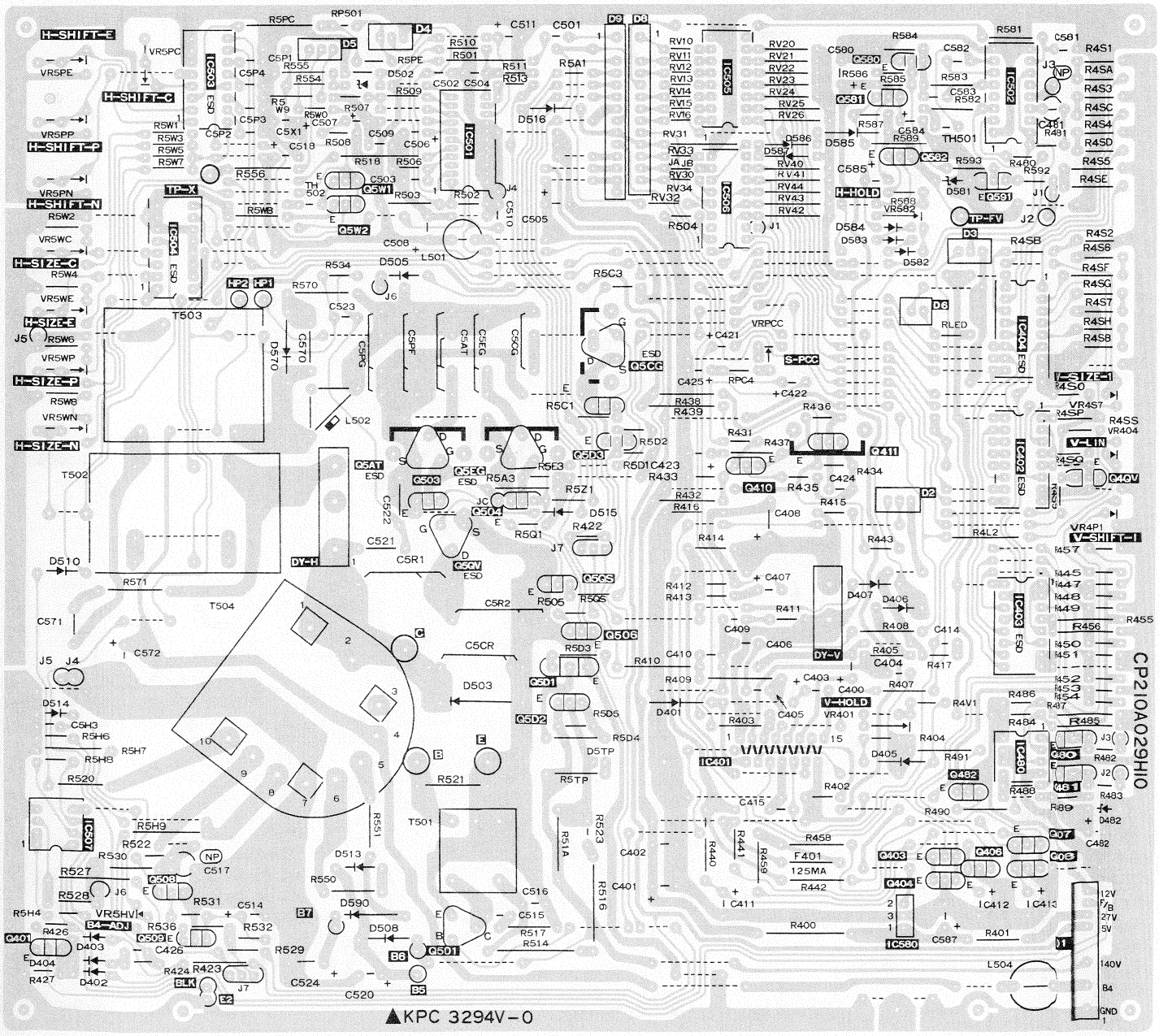
CONTROL LOCATION ON PCB DEFL



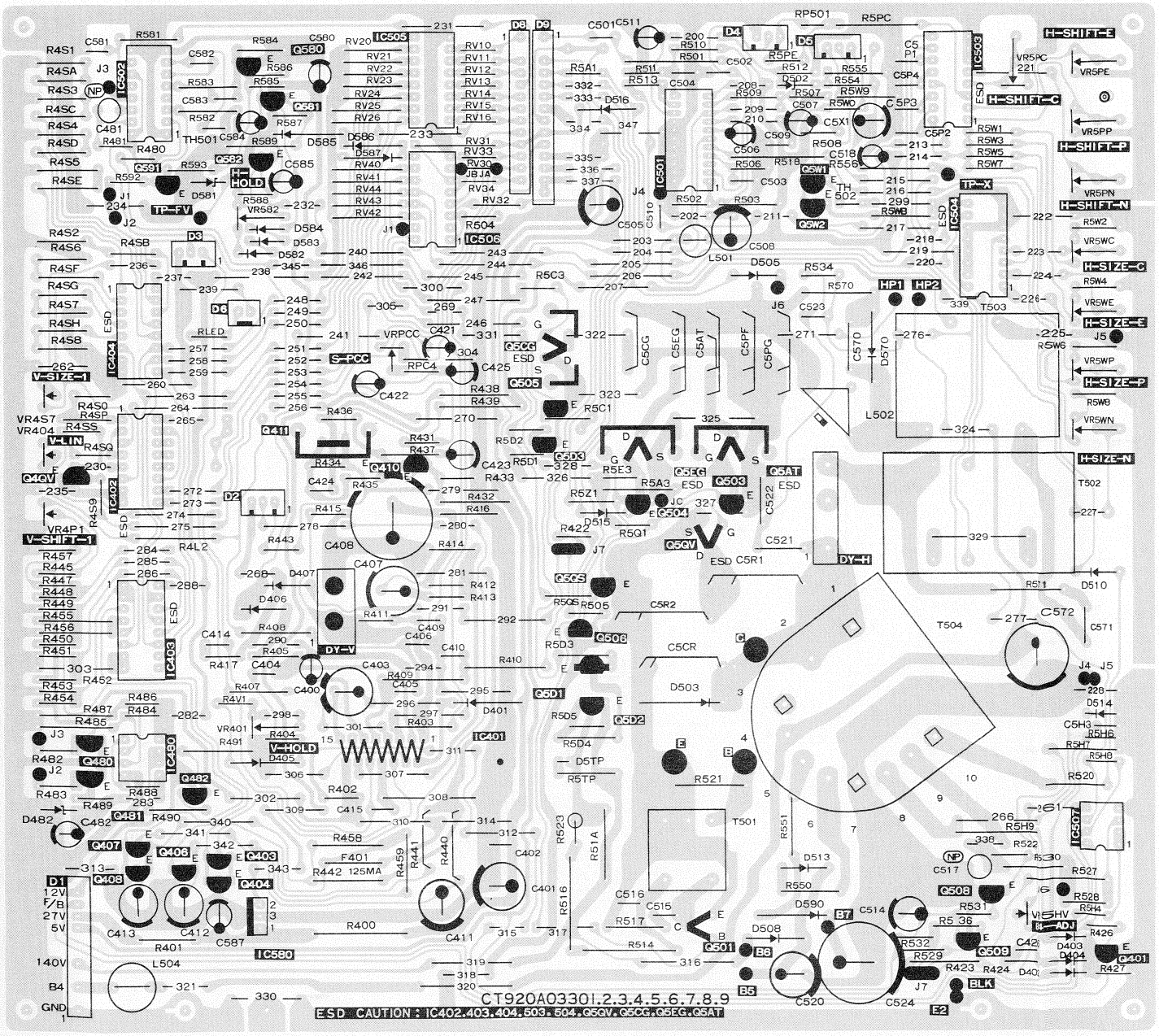
CONTROL LOCATION ON PCB VIDEO

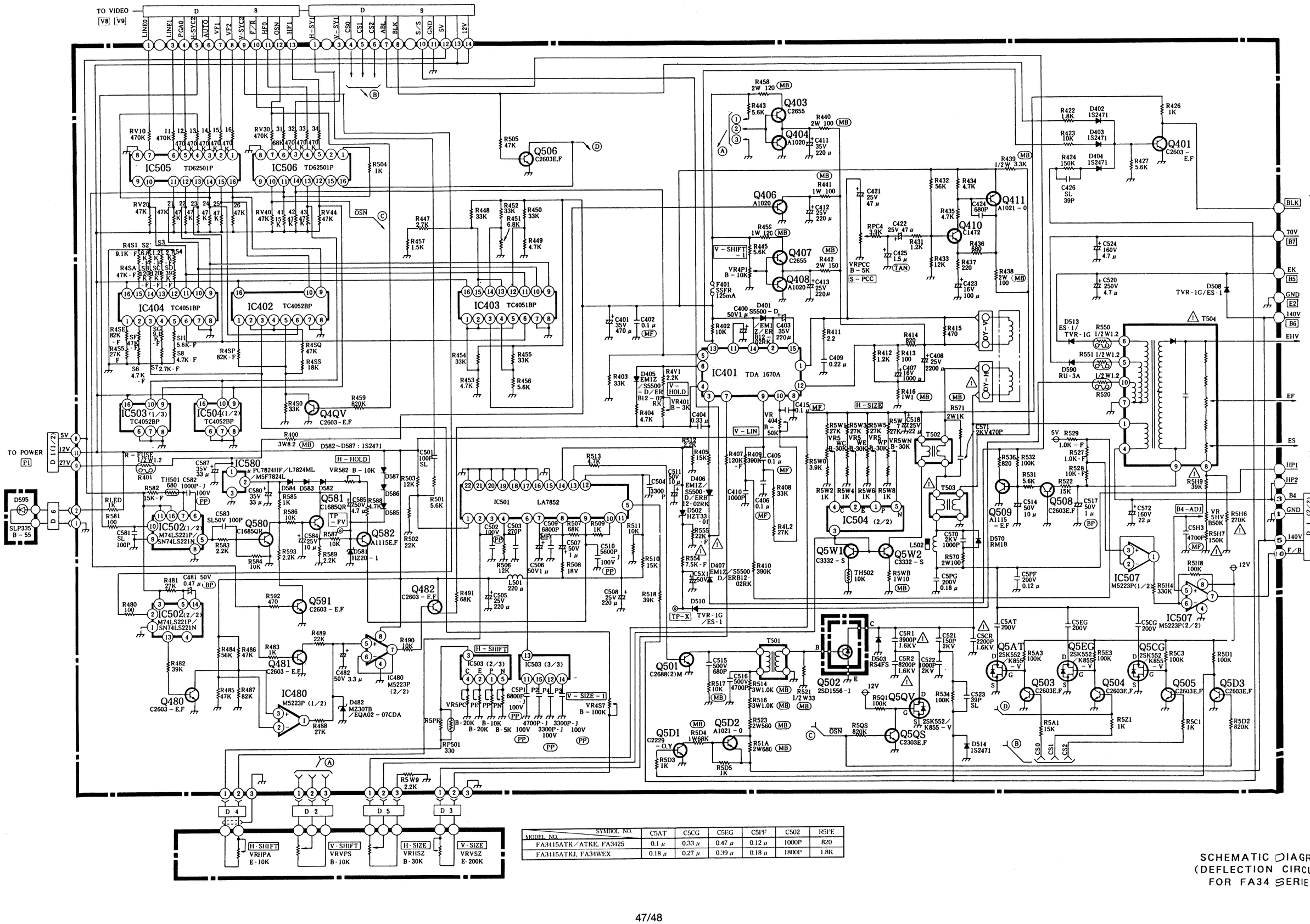


Main P.C.B. soldering side



Main P.C.B. component side




TO VIDEO [V8] [V9]
D 8
D 9
LINE0
LINE1
PGA0
H-SYC2
AUTO
VF1
VF2
V-SYC2
F/R
HFO
OSN
HF1
H-SY1
V-SY1
CSO
CS1
CS2
ABL
BLK
S/S
GND
5V
12V
IC505 TD62501P
IC506 TD62501P
IC504 TC4051BP
IC402 TC4052BP
IC403 TC4051BP
IC503 (1/3) TC4052BP
IC504 (1/2) TC4052BP
IC580 μPC7824HF/L7824ML-M5F7824L
IC502 (1/2) M74LS221P/SN74LS221N
IC501 LA7852
IC480 M5223P (1/2)
IC507 M5223P(1/2)
IC507 M5223P(2/2)
IC401 TDA 1670A
Q403 C2655
Q404 A1020
Q406 A1020
Q407 C2655
Q408 A1020
Q401 C2603-E,F
Q410 C1472
Q411 A1021-0
Q506 C2603E,F
Q4QV C2603-E,F
Q581 C1685QR
Q580 C1685QR
Q582 A1115E,F
Q591 C2603-E,F
Q482 C2603-E,F
Q481 C2603-E,F
Q480 C2603-E,F
Q501 C2688(2)M
Q502 2SD1556-1
Q5W1 C3332-S
Q5W2 C3332-S
Q5QV 2SK552/K855-V
Q5QS C2303E,F
Q5D1 C2229-O,Y
Q5D2 A1021-0
Q5AT 2SK552/K855-V
Q5EG 2SK552/K855-V
Q5CG 2SK552/K855-V
Q503 C2603E,F
Q504 C2603E,F
Q505 C2603E,F
Q5D3 C2603E,F
Q509 A1115-E,F
Q508 C2603E,F
D401 S5500-D
D402 1S2471
D403 1S2471
D404 1S2471
D405 EM1Z/S5500-D/ER B12-02RK
D406 EM1Z/S5500-D/ERB12-02RK
D407 EM1Z/S5500-D/ERB12-02RK
D482 MZ307B/EQA02-07CDA
D502 HZT33-01
D508 TVR-1G/ES-1
D510 TVR-1G/ES-1
D513 ES-1/TVR-1G
D590 RU-3A
D595 SLP335 B-55
D570 RM1B
T501
T502
T503
T504
L501 220μ
L502
TH501 680 1000P-J 100V
TH502 10K
F401 SSFR 125mA
VR401 B-3K
VR582 B-10K
VR4P1 B-10K
VR4S7 B-100K
VR404 B-50K
VRPCC B-5K S-PCC
VR5W1 27K WC B-30K
VR5W3 27K WE B-30K
VR5W5 27K WP B-30K
VR5WN B-30K
RP501 330
R400 3W8.2 (MB) D582~D587 : 1S2471
R401 R-FUSE 1/2W1.2
R4S1 9.1K-F
R4SA 47K-F
R4SB 82K-F
R4SC 27K-F
R4SD 39K-F
R4SE 82K-F
R4SF 47K-F
R4SG 27K-F
R4SH 5.6K-F
R4SI 4.7K-F
R4SJ 2.7K-F
R4SK 4.7K-F
R4SL 2.7K-F
R4SM 82K-F
R4SO 33K
R4SP 82K-F
R4SQ 47K
R4SS 18K
R501 5.6K
R502 22K
R503 12K
R504 1K
R505 47K
R506 12K
R507 68K
R508 18V
R509 1K
R510 15K
R511 10K
R513 4.7K
R514 3W1.0K (MB)
R516 3W1.0K (MB)
R517 10K (MB)
R518 39K
R521 1/2W33
R523 2W560 (MB)
R51A 2W680 (MB)
R5D3 1K
R5D5 1K
R5P1 B-20K
R5P2 B-10K
R5P3 B-20K
R5P4 B-10K
R5P5 B-5K
R5P6 B-20K
R5QS 820K
R5W0 3.9K
R5W1 27K
R5W2 1K
R5W3 27K
R5W4 1K
R5W5 27K
R5W6 1K
R5W7 27K
R5W8 1K
R5W9 2.2K
R5WB 1W10 (MB)
R5Q1 100K
R5A1 15K
R5A3 100K
R5E3 100K
R5C3 100K
R5D1 100K
R5Z1 1K
R5C1 1K
R5D2 820K
R5A 100K
R5E 100K
R5C 100K
R5D 100K
R5Z 1K
R5C 1K
R5D 820K
R5E 1K
R5F 1K
R5G 1K
R5H 1K
R5I 1K
R5J 1K
R5K 1K
R5L 1K
R5M 1K
R5N 1K
R5O 1K
R5P 1K
R5Q 1K
R5R 1K
R5S 1K
R5T 1K
R5U 1K
R5V 1K
R5W 1K
R5X 1K
R5Y 1K
R5Z 1K
R5a 1K
R5b 1K
R5c 1K
R5d 1K
R5e 1K
R5f 1K
R5g 1K
R5h 1K
R5i 1K
R5j 1K
R5k 1K
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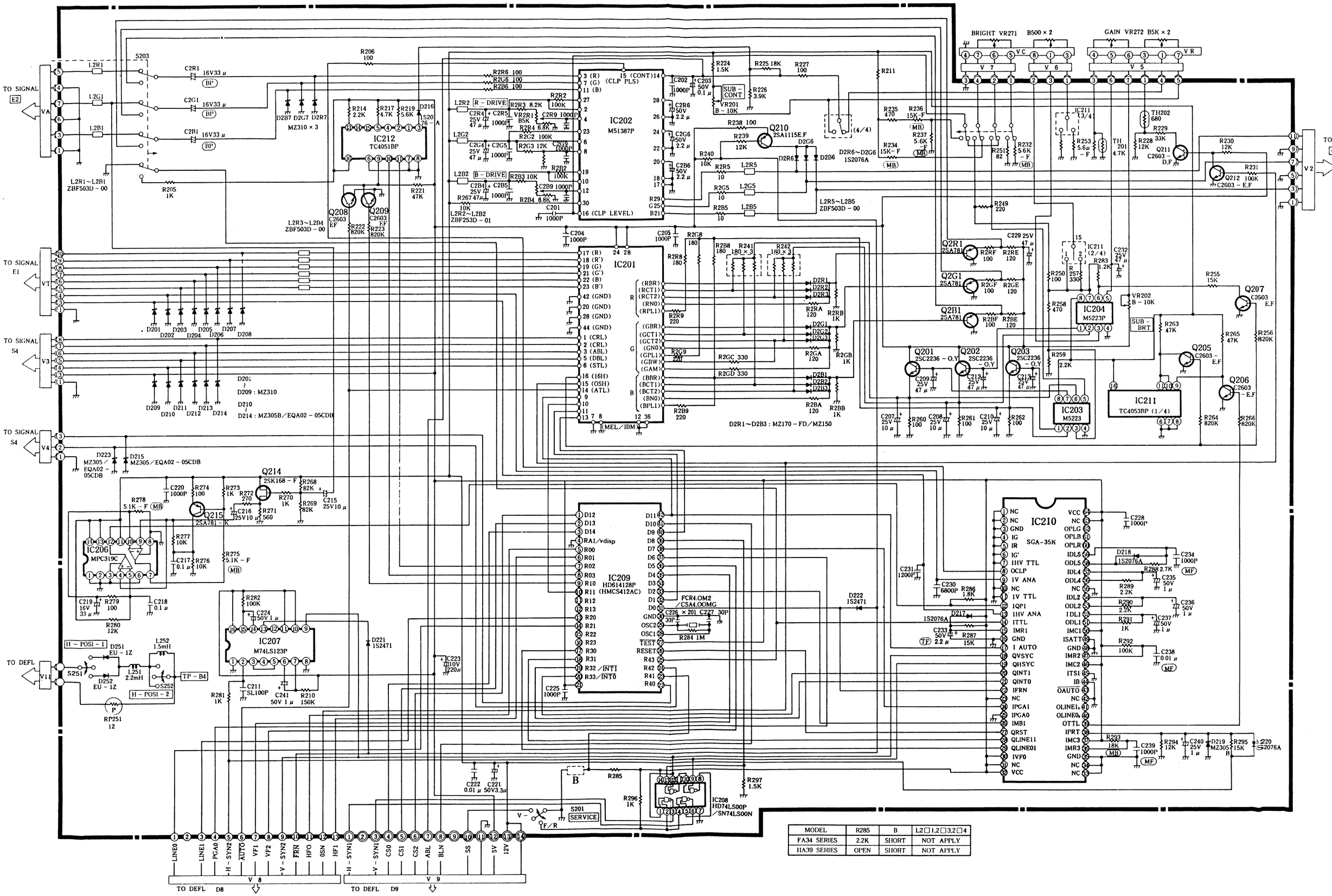
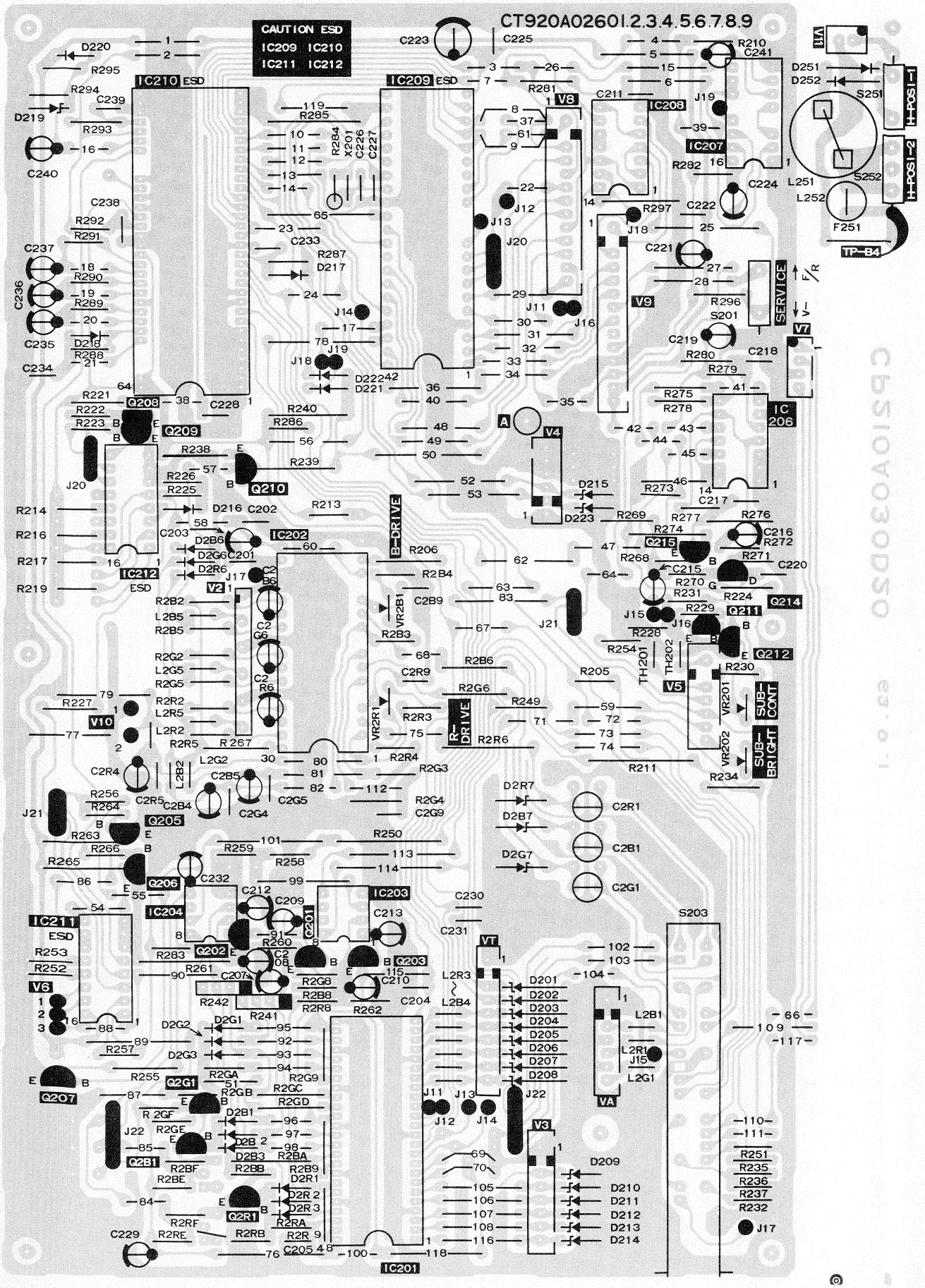
R5p 1K
R5q 1K
R5r 1K
R5s 1K
R5t 1K
R5u 1K
R5v 1K
R5w 1K
R5x 1K
R5y 1K
R5z 1K
R5A 1K
R5B 1K
R5C 1K
R5D 1



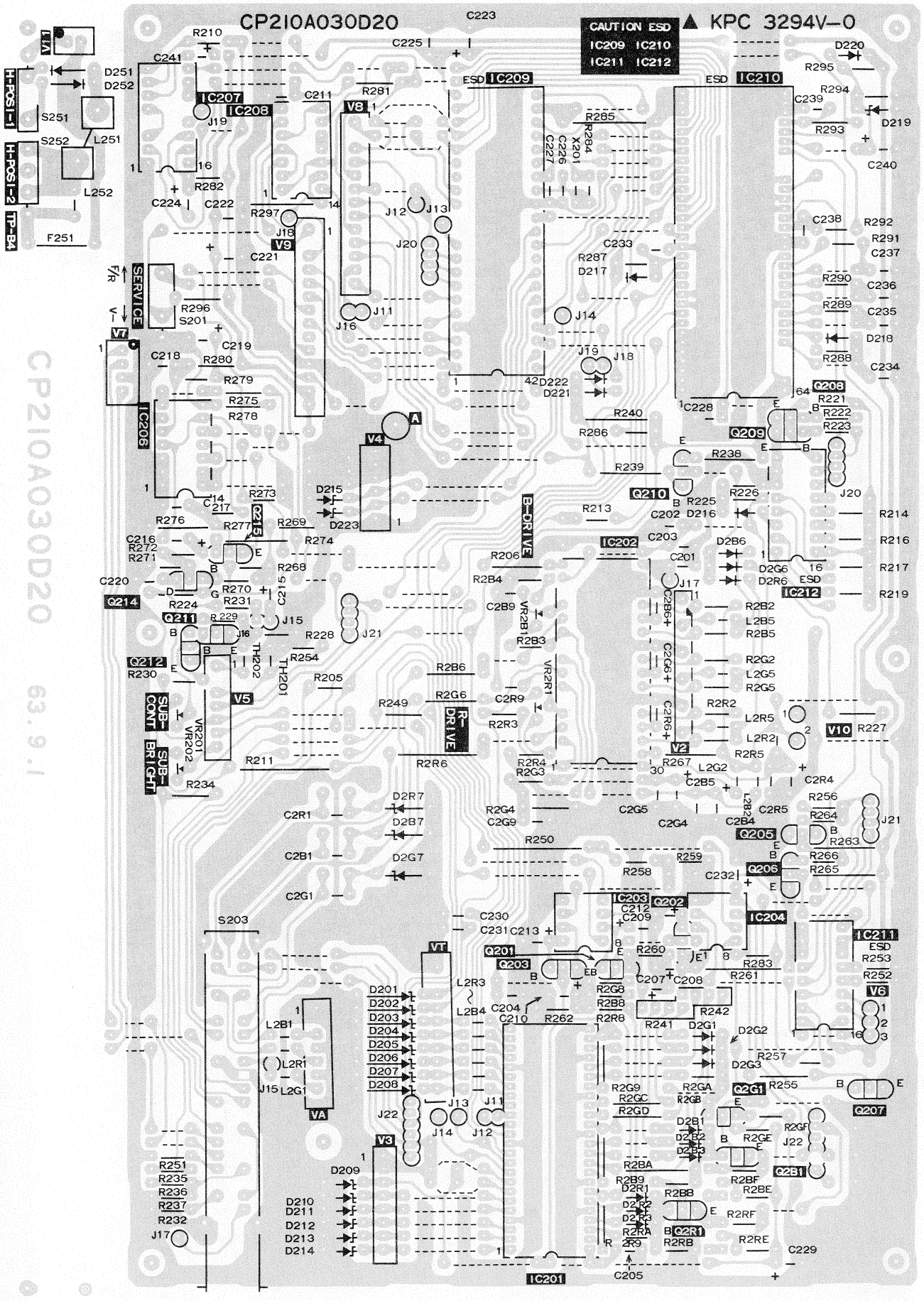
MODEL	R285	B	L2□1.2□3.2□4
FA34 SERIES	2.2K	SHORT	NOT APPLY
HA39 SERIES	OPEN	SHORT	NOT APPLY

SCHEMATIC DIAGRAM (VIDEO CIRCUIT)

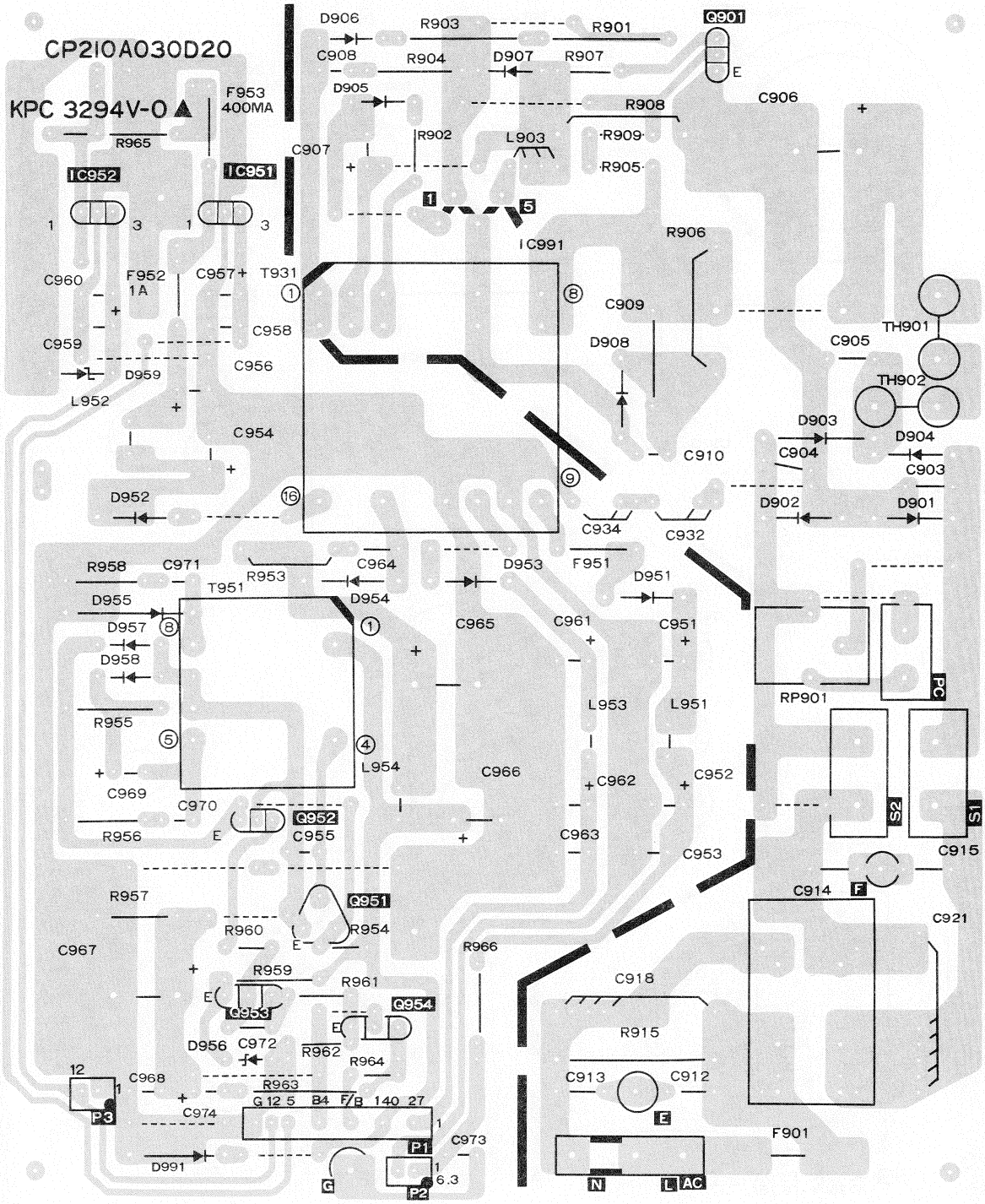
Video P.C.B.
Component side



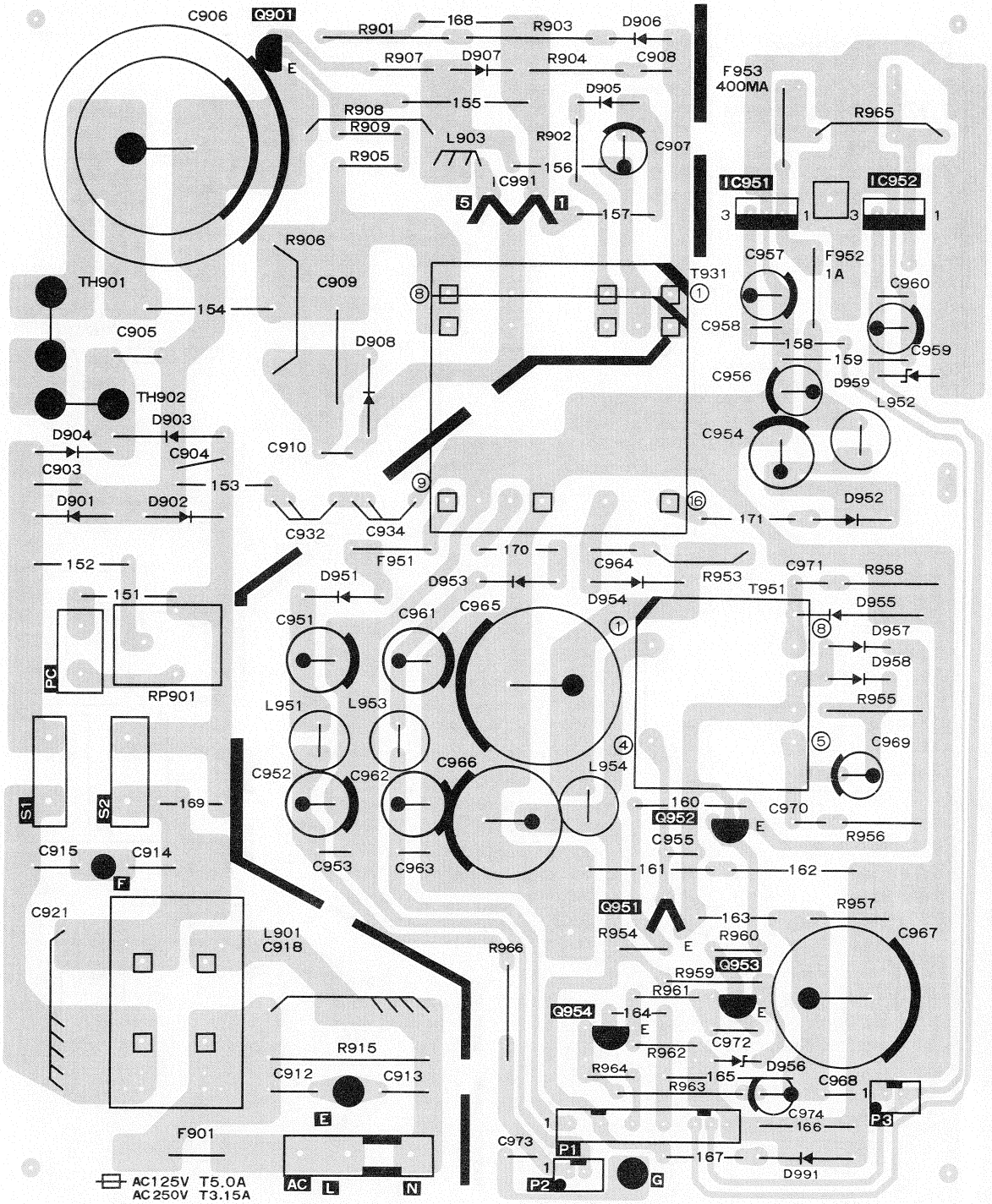
Video P.C.B.
Soldering side

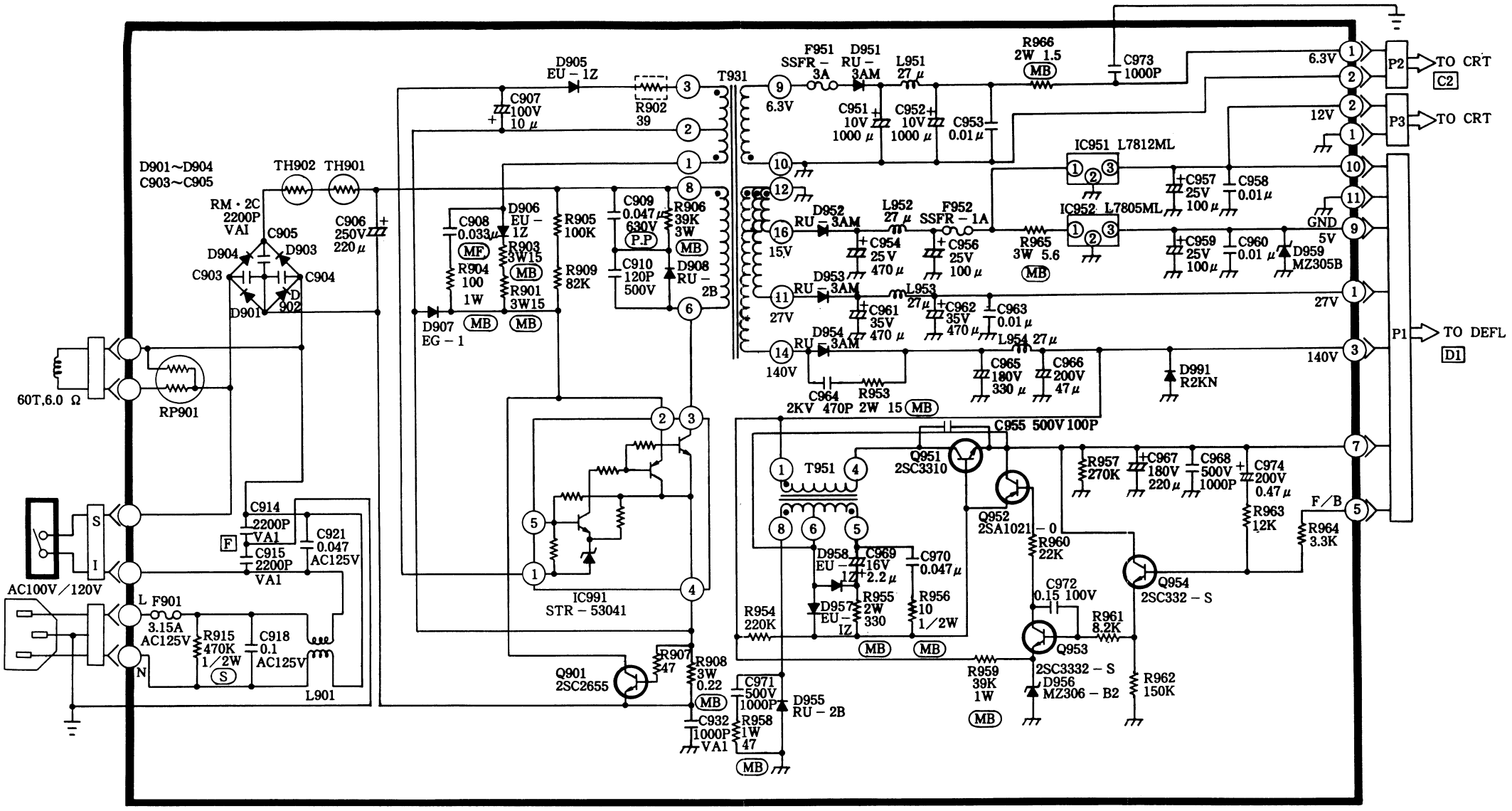


Power P.C.B.
Soldering side



Power P.C.B.
Component side

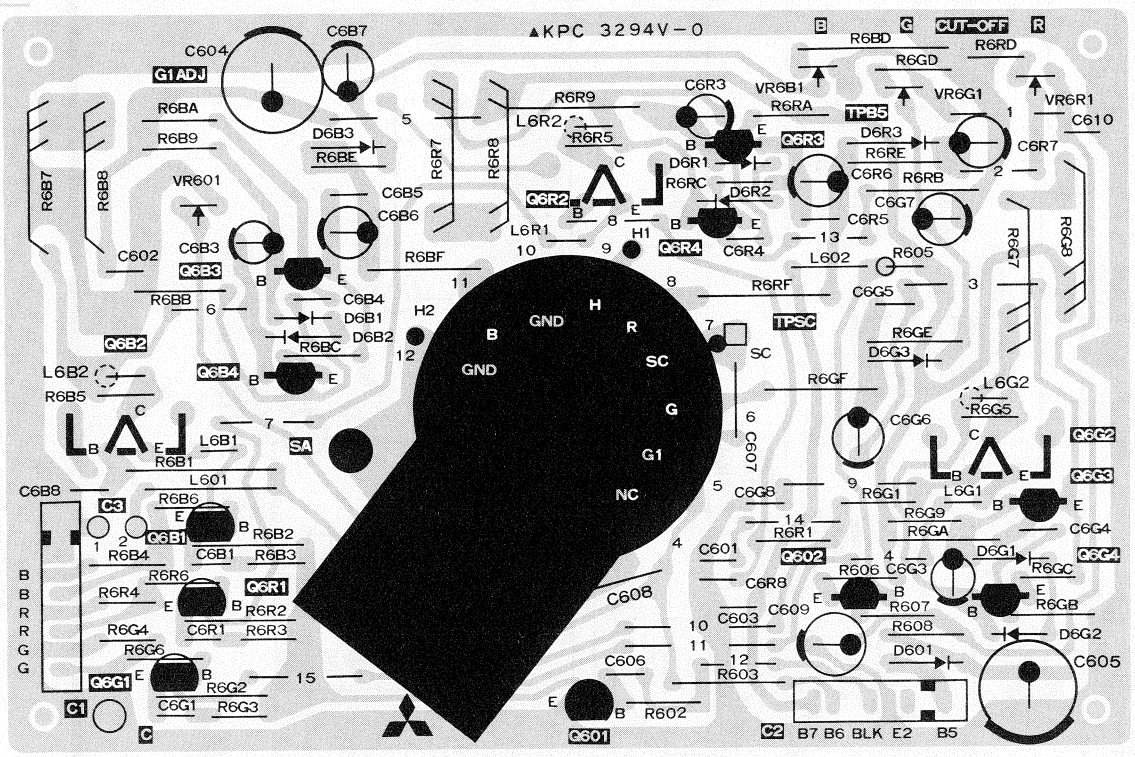




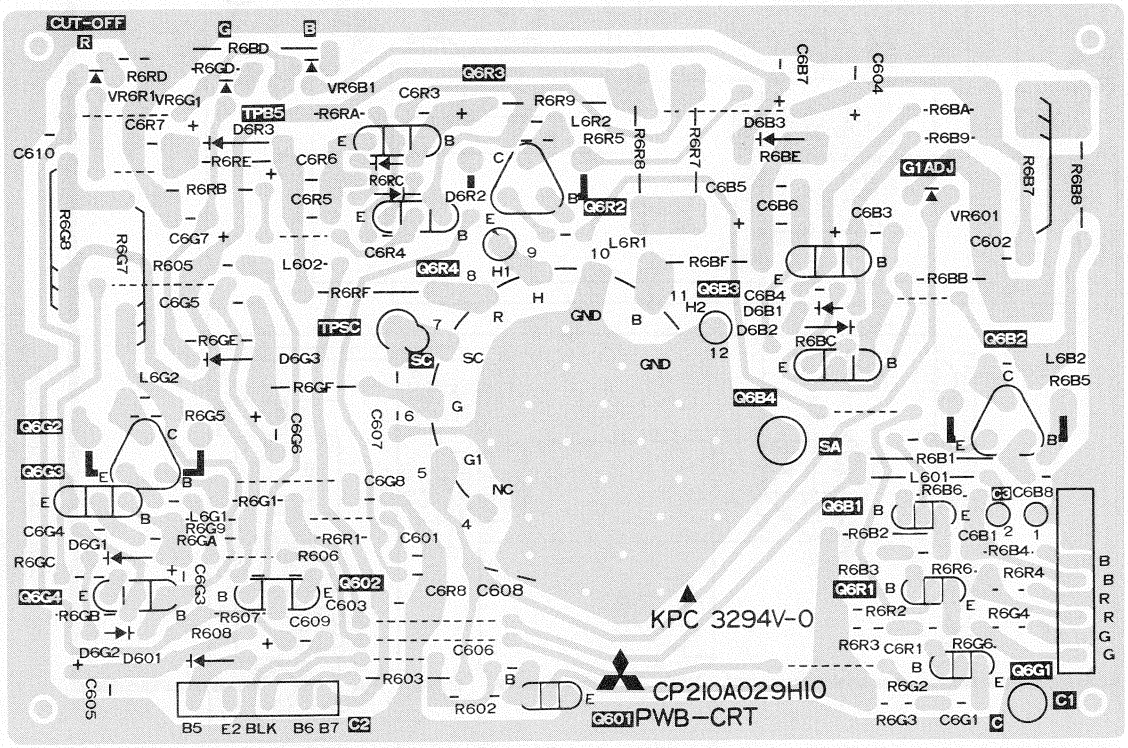
L901 : ELF – 18D656KM
TH901,TH902 : NTH18D8R0LB
RP901 : PTH451C06BG080N140

SCHEMATIC DIAGRAM (POWER CIRCUIT)

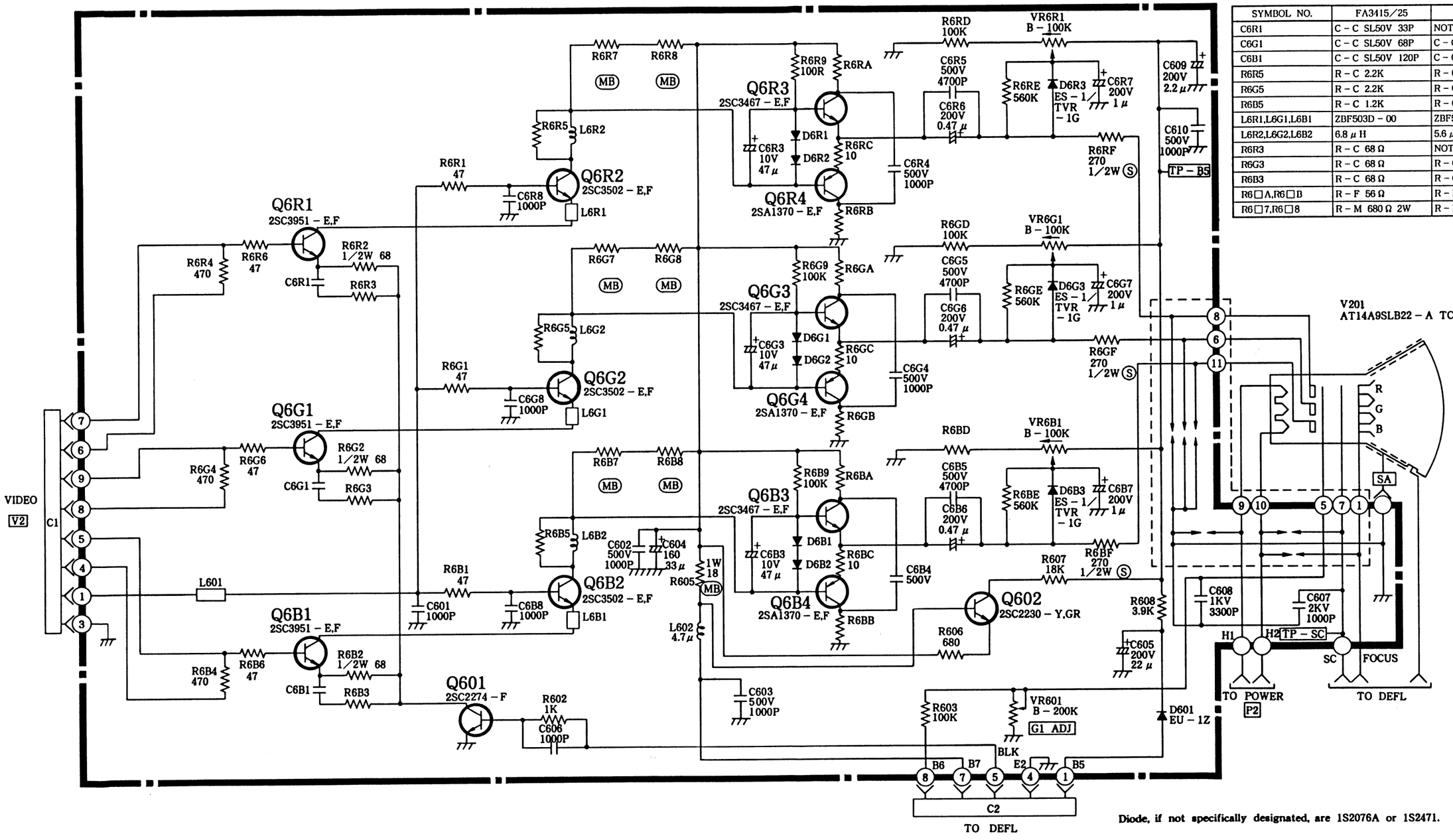
CRT P.C.B.
Component side



CRT P.C.B.
Soldering side



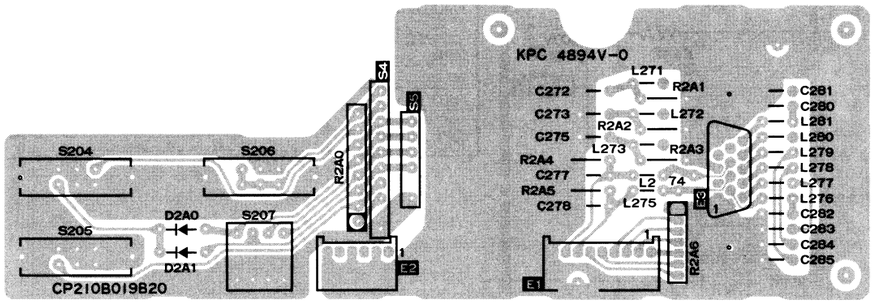
SYMBOL NO.	FA3415/25	HA3905	FA3405
C6R1	C – C SL50V 33P	NOT APPLY	C – C SL50V 33P
C6G1	C – C SL50V 68P	C – C SL50V 82P	C – C SL50V 47P
C6B1	C – C SL50V 120P	C – C SL50V 100P	C – C SL50V 100P
R6R5	R – C 2.2K	R – C 820 Ω	R – C 4.7K
R6G5	R – C 2.2K	R – C 820 Ω	R – C 4.7K
R6B5	R – C 1.2K	R – C 820 Ω	R – C 4.7K
L6R1,L6G1,L6B1	ZBF503D – 00	ZBF504D – 00	ZBF503D – 00
L6R2,L6G2,L6B2	6.8 μ H	5.6 μ H	6.8 μ M
R6R3	R – C 68 Ω	NOT APPLY	R – C 68 Ω
R6G3	R – C 68 Ω	R – C 120 Ω	R – C 68 Ω
R6B3	R – C 68 Ω	R – C 120 Ω	R – C 68 Ω
R6□A,R6□B	R – F 56 Ω	R – F 56 Ω	R – C – 25 150 Ω
R6□7,R6□8	R – M 680 Ω 2W	R – M 680 Ω 3W	R – M 680 Ω 2W



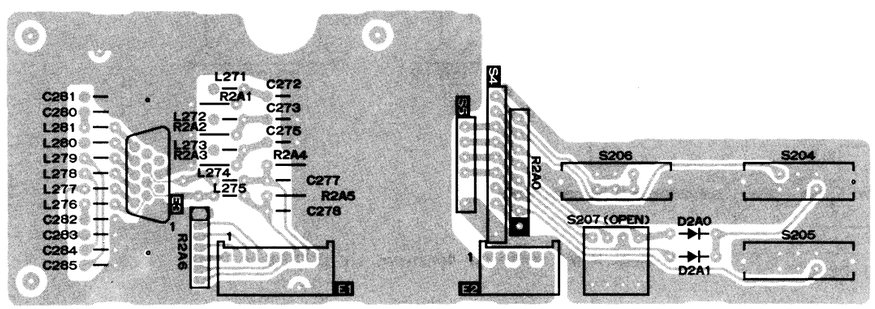
Diode, if not specifically designated, are 1S2076A or 1S2471.

SCHEMATIC DIAGRAM (CRT CIRCUIT)

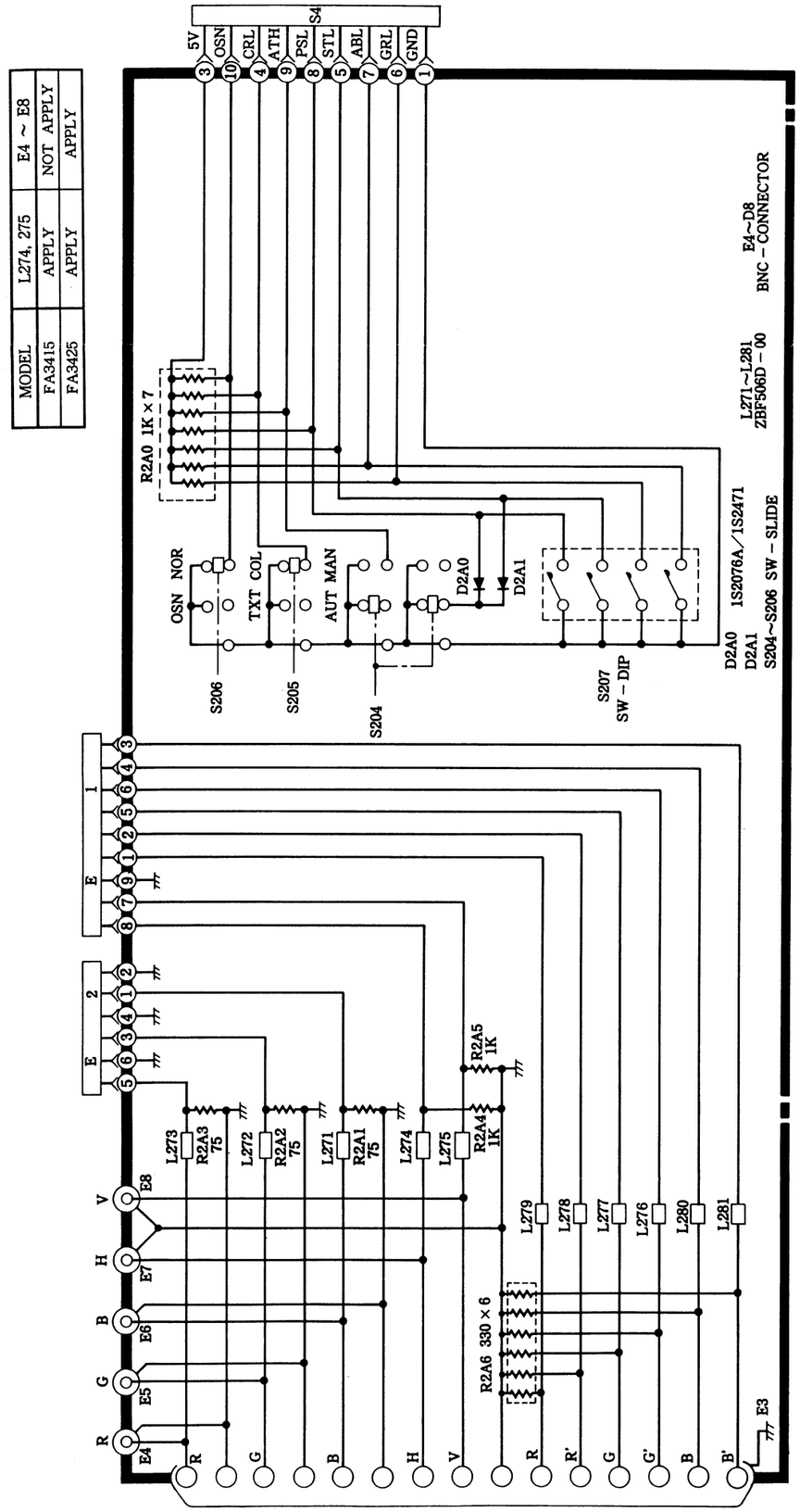
Signal P.C.B.
Soldering side



Signal P.C.B.
Component side



MODEL	L274, 275	E4 ~ E8
FA3415	APPLY	NOT APPLY
FA3425	APPLY	APPLY



SCHEMATIC DIAGRAM (PWB-TERMINAL CIRCUIT) FOR FA34 SERIES

Ersatzteilliste für MS 14
Parts list for MS 14

Best.-Nr. Part.-No.	Bezeichnung	Description	Zeich.-Pos. Ref.-No.	Preisgruppe
IC				
46 060 00	IC MB 111 T203	IC MB 111 T203	IC 201	D 8
46 061 00	IC M 5138 P	IC M 51387 P	IC 202	E 4
40 118 00	IC M 5223 P	IC M 5223 P	IC 203, 204, 480	A 8
46 062 00	IC µPC 319 C	IC µPC 319 C	IC 206	C 4
40 961 00	IC 74 LS 123	IC 74 LS 123	IC 207	A 5
26 121 00	IC 74 LS 00	IC 74 LS 00	IC 208	A 5
46 063 00	IC HD 614128	IC HD 614128	IC 209	D 5
46 064 00	IC MB 674157	IC MB 674157	IC 210	D 0
26 100 00	IC 4053	IC 4053	IC 211	B 2
26 101 00	IC 4051	IC 4051	IC 212, 403, 404	B 2
15 468 00	IC TDA 1670	IC TDA 1670	IC 401	C 0
46 065 00	IC 4052	IC 4052	IC 402, 503, 504	C 0
46 066 00	IC LA 7852	IC LA 7852	IC 501	C 4
44 965 00	IC 74 LS 221	IC 74 LS 221	IC 502	B 6
46 067 00	IC TD 62501 P	IC TD 62501 P	IC 505, 506	C 4
40 118 00	IC M 5223 P	IC M 5223 P	IC 507	A 8
46 068 00	IC MPC 7824	IC MPC 7824	IC 580	B 5
17 698 00	IC L 7812	IC L 7812	IC 951	B 5
06 977 00	IC L 7805	IC L 7805	IC 952	B 1
46 069 00	IC STR-54041	IC STR-54041	IC 991	D 1
Transistoren/Transistors				
12 027 00	Trans 2 SC 2236	Trans 2 SC 2236	Q 201-203	A 6
32 569 00	Trans 2 SC 2603	Trans 2 SC 2603	Q 205-209, 211	A 7
46 070 00	Trans 2 SA 1115	Trans 2 SA 1115	Q 210, 509, 582	B 1
32 569 00	Trans 2 SC 2603	Trans 2 SC 2603	Q 212, 401, 480	A 7
46 071 00	Trans 2 SK 168	Trans 2 SK 168	Q 214	B 2
46 072 00	Trans 2 SA 781	Trans 2 SA 781	Q 215, 2R1, 2G1	B 5
46 073 00	Trans 2 SC 2655	Trans 2 SC 2655	Q 403, 407, 901	B 2
46 074 00	Trans 2 SA 1020	Trans 2 SA 1020	Q 404, 406, 408	B 2
46 075 00	Trans 2 SC 1472	Trans 2 SC 1472	Q 410	B 1
46 076 00	Trans 2 SA 1021	Trans 2 SA 1021	Q 411, 5D2, 952	B 4
32 569 00	Trans 2 SC 2603	Trans 2 SC 2603	Q 481, 482, 4QV	A 7
45 731 00	Trans 2 SC 2688	Trans 2 SC 2688	Q 501	B 2
46 077 00	Trans 2 SD 1556	Trans 2 SD 1556	Q 502	C 4
32 569 00	Trans 2 SC 2603	Trans 2 SC 2603	Q 503-506, 508	A 7
08 011 00	Trans 2 SC 1685	Trans 2 SC 1685	Q 580, 581	A 5
32 569 00	Trans 2 SC 2603	Trans 2 SC 2603	Q 591	A 7
21 313 00	Trans 2 SC 2274	Trans 2 SC 2274	Q 601	A 9
24 961 00	Trans 2 SC 2230	Trans 2 SC 2230	Q 602	A 5
46 078 00	Trans 2 SC 3310	Trans 2 SC 3310	Q 951	C 2
46 079 00	Trans 2 SC 3332	Trans 2 SC 3332	Q 954	B 2
46 080 00	Trans 2 SC 3951	Trans 2 SC 3951	Q 6R1, 6G1, 6B1	C 2
46 081 00	Trans 2 SC 3502	Trans 2 SC 3502	Q 6R2, 6G2, 6B2	B 4
46 079 00	Trans 2 SC 3332	Trans 2 SC 3332	Q 5W1, 5W2, 953	B 2
32 569 00	Trans 2 SC 2603	Trans 2 SC 2603	Q 5D3, 5QS	A 7
46 083 00	Trans 2 SC 2229	Trans 2 SC 2229	Q 5D1	B 2
46 072 00	Trans 2 SA 781	Trans 2 SA 781	Q 2B1	B 5
46 085 00	Trans 2 SA 1370	Trans 2 SA 1370	Q 6R4, 6G4, 6B4	B 2
46 086 00	Trans 2 SC 3467	Trans 2 SC 3467	Q 6R3, 6G3, 6B3	B 2
46 087 00	Trans 2 SK 552	Trans 2 SK 552	Q 5AT, 5CG, 5EG	C 7
46 087 00	Trans 2 SK 552	Trans 2 SK 552	Q 5QV	C 7

Ersatzteilliste für MS 14
Parts list for MS 14

Best.-Nr. Part.-No.	Bezeichnung	Description	Zeich.-Pos. Ref.-No.	Preisgruppe
Dioden/Diodes				
37 408 00	Diode 1 S 2471	Diode 1 S 2471	D 1A0, 2A1	B 0
22 957 00	Diode MA 170-FD	Diode MA 170-FD	D 2B1, 2B2, 2B3	A 3
22 957 00	Diode MA 170-FD	Diode MA 170-FD	D 2G1, 2G2, 2G3	A 3
22 957 00	Diode MA 170-FD	Diode MA 170-FD	D 2R1, 2R2, 2R3	A 3
37 408 00	Diode 1 S 2471	Diode 1 S 2471	D 2R6, 2G6, 2B6	B 0
46 091 00	Z-Diode MZ 310	Z-Diode MZ 310	D 2B7, 2G7, 2R7	B 1
37 408 00	Diode 1 S 2471	Diode 1 S 2471	D 6B1, 6G1, 6R1	A 1
37 408 00	Diode 1 S 2471	Diode 1 S 2471	D 6B2, 6G2, 6R2	A 1
46 098 00	Diode TVR 1 G	Diode TVR 1 G	D 6B3, 6G3, 6R3	B 3
46 091 00	Z-Diode MZ 310	Z-Diode MZ 310	D 201-209	B 1
21 357 00	Z-Diode MZ 305 B	Z-Diode MZ 305 B	D 210-215	A 4
37 408 00	Diode 1 S 2471	Diode 1 S 2471	D 216-218, 220	B 0
21 357 00	Z-Diode MZ 305 B	Z-Diode MZ 305 B	D 219, 223	A 4
37 408 00	Diode 1 S 2471	Diode 1 S 2471	D 221, 222, 514	A 1
46 093 00	Diode EU 1 Z	Diode EU 1 Z	D 251, 252	B 1
46 094 00	Diode S 5500-D	Diode S 5500-D	D 401, 405-407	B 0
37 408 00	Diode 1 S 2471	Diode 1 S 2471	D 402-404	A 1
46 095 00	Z-Diode MZ 307 B	Z-Diode MZ 307 B	D 482	B 0
46 096 00	Z-Diode HZT 33-01	Z-Diode HZT 33-01	D 502	B 3
46 097 00	Diode RS-4 FS	Diode RS-4 FS	D 503	B 6
46 098 00	Diode TVR 1 G	Diode TVR 1 G	D 508, 510, 513	B 3
46 099 00	Diode RM-1 B	Diode RM -1 B	D 570	B 1
46 100 00	Z-Diode HZ 20-1	Z-Diode HZ 20-1	D 581	B 0
37 408 00	Diode 1 S 2471	Diode 1 S 2471	D 582-587	B 0
46 101 00	Diode RU-3 A	Diode RU-3 A	D 590	B 3
46 102 00	LED SLP-335B-55	LED SLP-335B-55	D 595	B 1
46 093 00	Diode EU 1 Z	Diode EU 1 Z	D 601	B 1
46 104 00	Diode RM-2 C	Diode RM-2 C	D 901-904	B 4
46 093 00	Diode EU 1 Z	Diode EU 1 Z	D 905, 906	B 1
46 106 00	Diode EG-1	Diode EG-1	D 907	B 3
46 107 00	Diode RU-2 B	Diode RU-2 B	D 908	B 3
46 108 00	Diode RU-3 AM	Diode RU-3 AM	D 951-954	B 4
46 107 00	Diode RU-2 B	Diode RU-2 B	D 955	B 3
46 110 00	Z-Diode MZ 306-B 2	Z-Diode MZ 306-B 2	D 956	B 0
46 093 00	Diode EU 1 Z	Diode EU 1 Z	D 957, 958	B 1
21 357 00	Z-Diode MZ 305 B	Z-Diode MZ 305 B	D 959	A 4
46 112 00	Diode R 2 KN	Diode R 2 KN	D 991	B 5
Verschiedenes/Miscellaneous				
46 137 00	Trimmpoti B-10k Ohm	Resistor semifixed B-10k Ohm	VR 404, 5HV	C 2
46 138 00	Trimmpoti B-100k Ohm	Resistor semifixed B-100k Ohm	VR 457	C 2
46 139 00	Trimmpoti B-10k Ohm	Resistor semifixed B-10k Ohm	VR 582, 5PP	B 1
46 140 00	Trimmpoti B-200k Ohm	Resistor semifixed B-200k Ohm	VR 601	C 2
46 141 00	Trimmpoti B-3k Ohm	Resistor semifixed B-3k Ohm	VR 2B1	B 1
46 142 00	Trimmpoti B-5k Ohm	Resistor semifixed B-5k Ohm	VR 2R1	B 1
46 143 00	Trimmpoti B-20k Ohm	Resistor semifixed B-20k Ohm	VR 5PC, 5PE	B 1
46 144 00	Trimmpoti B-5k Ohm	Resistor semifixed B-5k Ohm	VR 5PN	B 1
46 145 00	Trimmpoti B-30k Ohm	Resistor semifixed B-30k Ohm	VR 5WC, 5WE, 5WN	B 1
46 145 00	Trimmpoti B-30k Ohm	Resistor semifixed B-30k Ohm	VR 5WP	B 1
46 147 00	Trimmpoti B-100k Ohm	Resistor semifixed B-100k Ohm	VR 6B1, 6G1, 6R1	C 2
46 148 00	Trimmpoti B-5k Ohm	Resistor semifixed B-5k Ohm	VR PCC	B 1
46 149 00	Drehwi Bildhöhe B-200k Ohm	Resistor PWB B-200k Ohm	VR VSZ	B 3
46 150 00	Drehwi Bildlage B-10k Ohm	Resistor PWB B-10k Ohm	VR VPS	B 5
46 151 00	Drehwi Bildhöhe B-30k Ohm	Resistor PWB B-30k Ohm	VR HSZ	B 3
46 152 00	Drehwi Bildlage B-10k Ohm	Resistor PWB B-10k Ohm	VR HPA	B 5
46 153 00	PTC PTH 60 U 331 M	PTC PTH 60 U 331 M	RP 501	C 8
46 154 00	PTC PTH 451 C 41 BG 180 N 300	PTC PTH 451 C 41 BG 180 N 300	RP 901	C 1
46 155 00	Sich.-Widerstand 1,2 Ohm, ½ W	Resistor fuse 1.2 Ohm, ½ W	R 401, 520, 550	B 0
46 155 00	Sich.-Widerstand 1,2 Ohm, ½ W	Resistor fuse 1.2 Ohm, ½ W	R 551	B 0
46 157 00	Sich.-Widerstand 56 Ohm, ¼ W	Resistor fuse 56 Ohm, ¼ W	R 6BA, 6GA, 6RA	B 0
46 157 00	Sich.-Widerstand 56 Ohm, ¼ W	Resistor fuse 56 Ohm, ¼ W	R 6BB, 6GB, 6RB	B 0

Ersatzteilliste für MS 14
Parts list for MS 14

Best.-Nr. Part.-No.	Bezeichnung	Description	Zeich.-Pos. Ref.-No.	Preisgruppe
46 159 00	ELKO H450V 180µF	CE H450V 180µF	C 906	D 0
46 160 00	ELKO H180V 330µF	CE H180V 330µF	C 965	C 4
46 161 00	ELKO H180V 220µF	CE H180V 220µF	C 967	C 3
46 162 00	Keramik Quarz	Ceramic Resonator	X 201	B 7
46 163 00	Sicherung SSFR-125 mA	Fuse SSFR-125 mA	F 401	B 5
06 064 00	Sicherung 3,15 A-T	Fuse 3.15 A-T	F 901	A 2
46 164 00	Sicherung SSFR-3 A	Fuse SSFR-3 A	F 951	B 5
46 165 00	Sicherung SSFR-1 A	Fuse SSFR-1 A	F 952	B 5
46 166 00	Thermistor NTH 5 D 472 KA	Thermistor NTH 5 D 472 KA	TH 201	B 9
46 167 00	Thermistor NTH 5 D 681 KA	Thermistor NTH 5 D 681 KA	TH 202	B 9
46 168 00	Thermistor NTH 5 D 681 JA	Thermistor NTH 5 D 681 JA	TH 501	C 2
46 169 00	Thermistor NTH 5 D 103 JA	Thermistor NTH 5 D 103 JA	TH 502	B 9
46 170 00	Thermistor NTH 13 D 160 LB	Thermistor NTH 13 D 160 LB	TH 901, 902	B 9
46 171 00	Posistor PTH 60 U 331 M	Posistor PTH 60 U 331 M	RP 501	C 8
46 172 00	Posistor PTH 451 C 41 BG 180 N 300	Posistor PTH 451 C 41 BG 180 N 300	RP 901	C 1
46 113 00	Trafo H-Treiber	Transformer H-Drive	T 501	C 8
46 114 00	Trafo H-Amplitude	Transformer H-Width	T 502	D 7
46 115 00	Trafo Geometrie	Transformer Side-PCC	T 503	C 4
46 116 00	Trafo Zeilen	Transformer Flyback	T 504	G 3
46 117 00	Trafo Netz	Transformer Power	T 931	E 2
46 118 00	Trafo Hacker	Transformer Chopper	T 951	E 2
46 119 00	Spule Ferrite	Coil Core-Ferrite	L 2B5, 2G5, 2R5	B 3
46 120 00	Spule Ferrite	Coil Core-Ferrite	L 2B2, 2G2, 2R2	B 1
46 119 00	Spule Ferrite	Coil Core-Ferrite	L 6B1, 6G1, 6R1	B 3
46 122 00	Spule Resonanz	Coil Peaking 6.8 MHz	L 6B2, 6G2, 6R2	B 1
46 123 00	Spule Drossel	Coil Choke 2.2 MHz	L 251	D 1
46 124 00	Spule RF RCH855-152K	Coil RF RCH855-152K	L 252	B 4
46 125 00	Spule Ferrite	Coil Core-Ferrite	L 271-281	B 1
46 126 00	Spule RF 220MH	Coil RF 220 MHz	L 501	B 1
46 127 00	Spule linear	Coil H-Linearity	L 502	C 4
46 128 00	Spule Drossel	Coil Choke Power	L 504	B 5
46 129 00	Spule Ferrite	Coil Lead-Ferrite	L 601	B 0
46 130 00	Spule 4,7 MHz-K	Coil Peaking 4.7 MHz-K	L 602	B 1
46 131 00	Spule	Coil Line-Filter	L 901	D 6
46 132 00	Spule 27 MHz-K	Coil Filter 27 MHz-K	L 951-954	B 3
46 133 00	Trimmpoti B-10k Ohm	Resistor semifixed B-10k Ohm	VR 201, 202	C 2
46 134 00	Drehwi Helligk. B-500 Ohm	Resistor double B-500 Ohm	VR 271	B 7
46 135 00	Drehwi Kontrast B-5k Ohm	Resistor double B-5k Ohm	VR 272	B 7
46 136 00	Trimmpoli B-3k Ohm	Resistor semifixed B-3k Ohm	VR 401	B 1
46 054 00	Knopf	Knob VR		B 4
46 055 00	Umschalter 3stufig	Band Switch	S 201, 251, 252	B 3
46 056 00	Schiebeschalter, INPUT	Switch Lever	S 203	B 7
46 057 00	Schiebeschalter, SCAN-MODE-COLOR	Switch Slide	S 204, 205, 206	B 9
46 058 00	DIP-Schalter	Switch DIP	S 207	B 9
46 059 00	Netzschalter	Switch Push	S 901	C 2